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The Province of Alberta

PETROLEUM AND NATURAL GAS CONSERVATION BOARD

Application for Permission to Remove or cause to be removed Natural Gas from the Province of Alberta, under the Provisions of the Gas Resources Preservation Act by Northwest Natural Gas Company and Alberta Natural Gas Grid, Ltd.

I. N. McKinnon Esq., Chairman

D. P. Goodall Esq.

Dr. G. W. Govier

Session: JUNE 7th, 1950.

Volume 9

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ERRATA

VOLUME 8

Page	Line	Correction
555	23	"that he had taken into account" should read "that he had not taken into account"

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VOLUME 9

June 7th, 1950.

MR. NOLAN: Mr. Chairman and Gentlemen, I have taken the liberty of changing the seating arrangement for the witnesses. I found it very difficult from my place here to examine the witness without his having his head turned away from the Board. It is now my intention, with the permission of the Board, to interject into these proceedings the evidence of Mr. Swinerton, of whom I made mention yesterday. Mr. Swinerton, as I said, is a gentleman who has had long experience in construction work and we felt that it would be useful if we could have him come before the Board and tell the Board in a very general way something about how these estimates are made for the construction of pipe lines. We hope it will be useful. May I call Mr. Swinerton, please?

ALFRED B. SWINERTON, having been duly sworn, examined by Mr. Nolan, testified as follows:-

Q Mr. Swinerton, where do you reside?

A My office is in San Francisco but I reside at Woodside, San Mateo County, which is a suburb.

Q Of San Francisco?

A Yes.

Q You are engaged in construction work, are you?

A I am.

Q You are a graduate of what university?

A Stanford University.

Q In what?

A In Mining Engineering.

Q And might I ask you that most of your work really has been in construction work?

A A good deal.

Q Is it light construction or heavy?

A We do both. We do the building of heavy road work, pipe lines, dams, tunnels, etc.

Q Now, we have had two submissions put in. We have heard about Haddock-Engineers Limited and the Pacific Pipeline and Engineers Limited. Are you connected with those companies?

A Yes, I am connected with both companies.

Q And what is your connection with Haddock-Engineers Limited?

A I am a Vice-President of Haddock-Engineers Limited.

Q And Pacific Pipeline and Engineers Limited?

A I am the President of that company.

Q Now, would you be good enough, Mr. Swinerton, to tell us something of the work in which these companies are engaged?

A Haddock-Engineers Limited is a firm that is engaged primarily in heavy construction work.

Q Such as what?

A We build tunnels, dams, roads, in fact all kinds of heavy construction work.

Q And by "heavy construction work" you mean?

A Work that requires the use of heavy construction machinery.

Q And what about the other company, Pacific Pipeline?

A Pacific Pipeline and Engineers Limited is a company that is engaged in laying of pipe, either for oil, gas, water or sewage systems.

Q And I suppose in connection with this work you maintain a large staff of engineers?

A Yes.

Q And are you connected with any other companies?

A I am connected with Lindgren & Swinerton, which was first formed in 1888 and is the oldest construction company, as far as a continuous entity is concerned, in the United States.

Q And I take it that you have been connected with the laying of pipe lines in many parts of the world?

A I have.

Q Could you tell us in what places?

A We have laid pipe lines in most of the United States, 10 or 12 of the United States, and in Colombia and in South America.

Q And can you give us some idea of the length of any of those pipelines that your companies have laid?

A Yes, in South America we laid one in 1938 and 1939, a pipe line from the Venezuelan border across the Andes to the Gulf of Darien. I might say that was a wonderful job. We had to not only lay the pipe line but we had to build the roads. We also built 5 airfields. We also built the facilities at the producing end. In carrying out that work we had to fight Indians and in some cases had to kill them and run them out of the country in order that we could carry on the work. I might say that I was very proud of that job.

Q And I suppose that you have laid all sizes of pipe?

A We have laid from 50 inches down to 1 inch.

Q And what would the 50-inch pipe be?

A Water pipe.

Q Now, do you know Mr. Faison Dixon?

A I do.

Q When did you first meet him?

A I think it would be in the Fall of 1947.

Q Now, when you are consulted with respect to the laying of a pipe line how do you go about it? What is the first thing you do?

A We send our engineers, 6 or 8 or whatever number is required, out in the field to survey the route it is proposed to follow, to survey the nature of the country, the quality of the soil and all that sort of thing. Field notes are made which are then brought to the office and studies are made and estimates as to the cost.

Q Now, in making these surveys and estimates on these, or in connection with this particular work, what was first done?

A Mr. Goodbody selected the route, running through Southern Alberta into the States, the eastern end of the State of Washington and across Washington, with laterals running to British Columbia and down to Washington, north to Seattle, up to Vancouver and south as far as Portland.

Q There were a number of men of both your companies engaged in this work?

A Yes, there were at least 8 men engaged from time to time on the work.

Q Was any one of them continuously engaged in this work?

A Mr. Goodbody is the sponsor of the project, as we call them, and he had general charge of the work. And if he wanted any assistance from any other one of our officers he could ask for it and it would be given.

Q What do you mean by "sponsor"?

A A sponsor is the man who is in charge of the work.

Q And he has told us that this is a task that involved both of your companies, rather than any particular individual?

A That is correct.

Q Now, yesterday we had two reports submitted, one of which was marked Exhibit 14 and the other Exhibit No. 15. Exhibit No. 14 dealt with Route A. Have you personally been over those routes?

A Route A I went over from the Pacific Coast as far as Trail and Route B, I went over most of the route which is contained in the United States.

Q And what have you to say with respect first to Route A?

A I would say that a pipe line can be built anywhere if you have enough money to build it, but I would also say that anyone building a pipe line along Route A, if he has an alternative route, should have his head examined.

Q There are some difficulties, are there, in connection with Route A?

A There are. The first difficulty is not insurmountable. Coming up the Fraser Valley there are about two miles where you would have to put a tunnel. There is no other place to put a pipe line on account of the highway and railroad taking all the available space. But the worst place is Allison Pass immediately east of Hope, where there is a very good road and the pipe line would have to be adjacent to that road. It would be subject to slipping and sliding and they have to do a tremendous maintenance job to keep the highway open.

Q When you speak of maintenance, that involves more than actual repair, does it not?

A It does. It is to keep an uninterrupted service.

Q Would you like to make any comment on Route B, as to its feasibility?

A Route B is the southerly one. That one is open to maintenance the year round, from my personal observation. It is adjacent to highways that are maintained by the government and the cost of maintaining these highways would not be a cost of the purveyor but on the government.

Q There is only one other thing I wanted to ask you, if I may. Looking at this estimate with respect to Route B, do you consider it competitive under present conditions?

A I do.

Q And would you construct a line, or would your companies construct a line, for the sums contained in this estimate?

A We would, as of today.

Q And what you tell me about them being competitive in that you would construct a line for the amount mentioned would apply equally to Route A, as it does to Route B?

A Correct, sir.

MR. D. P. McDONALD: Pardon me a moment, Mr. Chairman, I want to look at the transcript of yesterday, if I might. The difficulty is this, Mr. Chairman, I do not want to finish or to start the cross-examination of Mr. Swinerton until I hear all Mr. Goodbody has to say about his report, which is the basis of Mr. Swinerton's conclusions that he has given us today.

MR. NOLAN: I realize perhaps I am not doing this in the proper order but as I explained before, and as I will explain again, it has been at great personal inconvenience to Mr. Swinerton to be here today because the plan he originally had could not be carried out, of being here earlier. It is imperative that he leave Calgary today.

,

As I said, he is on his way to Norway. He has made his engagements and he has made his arrangements and I am afraid I must take the position that he cannot remain over. These things do happen. He is here now to be cross-examined by Mr. McDonald, if there are any questions to be put to him. I am sorry we could not complete Mr. Goodbody's submission but Mr. Goodbody's submission has been in the hands of my learned friend for some days, so there can be no surprise about the matter.

MR. McDONALD: I have some general questions that probably Mr. Swinerton can deal with.

(Go to page 636)

Q I was just going to ask you this, Mr. Swinerton, with regard to the work done in South America. It was an oil line?

A That was an oil line.

Q It was a maximum size of 12 inch?

A That is right.

Q It crossed the Andes, as I understand?

A Yes.

Q At what height?

A 6400 at the summit.

Q 6400. Now, as I understand the reference to your firm, it was to select the best route from a point commencing somewhere in the vicinity of Pincher Creek and terminating somewhere at Vancouver, B.C.?

A Correct.

Q Those are your instructions?

A Yes. Of course, Calgary - - we always considered Calgary as the centre of the plan.

Q And that was in 1948?

A That was in 1948, yes.

Q And then, as I understand it, your first report was made in January 1949?

A Correct.

Q As a matter of fact, a report was made prior to that, was it not?

A I think the former report, I don't know the date of it, it is here and you have a copy of it.

Q The only thing I am referring to, there were documents filed with the Federal Power Commission by your client prior to

January 1949?

A We referred them to it. I do not know what date.

Q Then as I understand it, was there any specific instruction as to whether you should look for a route in Canada in 1948?

A Generally to find the best route. We are not instructed to put it through Canada, no, sir.

Q Then when you came to do your work in 1949, as outlined by Mr. Goodbody, it was with particular reference to Canadian routes, was it not?

A 1949, correct.

Q And the result of your work on the Canadian route is this Route A?

A That is correct.

Q Now, Mr. Swinerton, you dealt specifically this morning with ground sliding and slipping which would require constant maintenance in the Allison Pass area. Have you the detail as to where this ground is sliding and slipping?

A I have been over it. On the western side of the Pass immediately above Hope, I would say the first 10 miles or so.

Q The western side immediately above Hope?

A Yes.

Q And what about the area from Allison Pass east to Princeton, is it sliding and slipping there?

A On the eastern side it is not so bad.

Q Is there still some sliding?

A There is some but not the amount there is on the west side.

Q Now, would Mr. Goodbody have the exact detail of where these points are?

A I suppose he would.

Q What I have in mind is, can he tell us whether they are half a mile wide?

A I believe he could. I am sure he could.

Q And how many there are and where they are located on the map?

A He has gone over it and at so many feet I imagine he has his estimate of that ground.

Q And when you say "sliding and slipping", could you explain to me exactly what you mean?

A Well, there are several types of sliding ground. There is talus, where you dig down into it and it brings down a slide. You see that on roads and railroads. Then there is moving earth, which is generally the soft character, the water gets into it and it starts to slide, it slides and slides and keeps on sliding and any time you disturb it it accelerates that sliding, like digging a ditch or a road, whatever you put into it.

Q When you refer to constant maintenance?

A It will break the line, then you have to go up there and bulkhead and patch your line up to try to keep the service going. Now, you can do that in the summer. You might be shut down for 18 hours or maybe there would be enough residue in the pipe to keep it going. It is expensive but if that happens in the wintertime, then you are in a lot of trouble unless you can freeze the ground by opening it up or something. You have to keep crews and equipment there year in and year out to do that, and that is a very expensive continuing course in connection with the gas line or oil line or any other line.

Q I thought you said when it rained or got wet that that would create a lubricant, as it were, to the earth?

A It does.

Q And the weight of the earth above - -

A Would break the pipe.

Q And strip the seams, the welds?

A Yes.

Q Now, this condition of necessity must be on a sidehill, there must be a gravity movement of some kind?

A Yes.

Q So the obvious thing is to get around it if you can?

A Yes, put it elsewhere if possible.

Q Either above or below this condition?

A Yes.

Q The first thing an engineer would do when he would come to that would be to look for an alternate route?

A An alternate route, yes.

Q Now, are you familiar with any pipelines which are troubled with this particular condition?

A Yes, we have had them.

Q Where were they situated? Can you name any of them?

A There is one in San Luis Obispo County, which we built for the Standard Oil Company I guess 15 or 20 years ago and we had trouble with that.

Q Was the condition overcome?

A Yes, it was re-routed.

Q Re-routed?

A As a rule we do not locate pipelines, they are located by

the engineers. In this case we are locating it and knowing the hazards we are trying to locate it where they won't have them or have the minimum amount of hazards.

Q I take it that you are not happy to locate through this Hope to Princeton route at all?

A Not on that part of it, the western end there. There are other parts where it is going to be difficult to maintain but they have not got the sliding earth hazards, it is the access in winter makes them difficult.

Q Now, have you surveyed the Stevens Pass or have you been through the Stevens Pass?

A In Washington?

Q Yes?

A Yes.

Q You have followed route of the pipeline there?

A Yes.

Q Will it follow the highway?

A Close to the highway, that is, both on the western and the eastern side.

Q And did you observe any sliding and slipping in that area?

A No. There are a few tight places but not sliding.

Q I take it this condition you speak about is peculiar to this particular area on the Canadian side? I mean, it is peculiar in this particular area?

A In this particular area it is the only bad ground I have seen. There are various kinds of bad ground, but sliding ground is bad in that Allison Pass.

Q Well now, just how would this sliding and slipping affect

a highway built in the same vicinity?

A The same way it does the pipeline.

Q I mean, could you describe what the condition of the highway would be after a season, after say a year or two years' operation, say one year's operation?

A The road sloughs away or a slide comes on top of it, and it has to be cleared away and rebuilt at that point.

Q It will either just overflow the highway - -

A Or you re-fill it or dig more out of the slope.

Q Now, if it is just a question of flowing over the highway, that is just a question of moving it off?

A Yes.

Q And that type of sliding, would you actually say that is sliding and slipping ground?

A Yes, but the bulldozer slips with that.

Q The road must slip in addition?

A Yes.

Q If the road slips, what would be the indications?

A Well, you would get a pavement break.

Q And continual pounding would accelerate the slip?

A Break and crack as you go around it. The pipeline would break.

Q Now, you have mentioned this matter of constant maintenance for pipelines. What experience have you had in operating natural gas pipelines?

A None.

Q You have not had any?

A No.

Q And are you familiar with maintenance conditions on natural gas pipelines?

A Well, we have been called in to correct lines where they have had trouble and we have re-routed them.

Q You have not any experience in operating them?

A No, we are not in that business.

Q Has Mr. Goodbody had experience in operating a natural gas pipeline?

A I would rather he answer that.

Q Yes. So that I take it then that the references to maintenance in these two exhibits are not your evidence, as it were?

A No, not from operating experience.

Q And not your evidence personally?

A No.

Q You have referred to these access roads, Mr. Swinerton, particularly in South America. Were those roads built particularly for the purpose of constructing the line rather than for maintaining it in South America?

A Both angles. We had to built the road before we could build the line. We had to haul the pipe in there and you could not haul it unless you had a road to haul it on.

Q Have you varied the use of those lines for the purpose of maintenance since that time?

A Oh, they have maintained it.

Q I take it too that the question of maintenance costs of an operating gas line are not within the field of your study?

A No.

Q And I take it too that the details of construction costs

as will be given by Mr. Goodbody is an opinion of your firm?

A Yes.

Q And he has all the detail?

A They have confidence in his costs.

Q He has all the details?

A Yes.

Q Now, see if you will agree with me on this, Mr. Swinerton. The location of a line at any time is a matter of judgment of the engineer, he must weigh against the investment that he will have to make in the pipeline for the length of the line against the cost of installation?

A He is looking for the most economical way of putting the line in. He is not a financier figuring what income he will get off the line.

Q There are cases where he would advise an expensive installation in order to save length of pipe?

A Yes. It is a balance between the cost of your pipe and the cost of installing.

Q Now, to sum up your evidence, Mr. Swinerton, as I take it, you are of the opinion that this Route A can be built?

A Oh yes.

Q And it can be operated as a pipeline?

A Operated. I won't say continuously operated.

Q The only difference between the A and B Routes, as I understand your evidence, is that the B Route will cost less?

A Will cost less.

Q And in addition, in your opinion - -

A It would serve and you would have more customers.

Q Apart from that, thinking of the engineering only, the cost

of maintenance will be less?

A Yes, considerably less.

Q Considerably less, yes. And you feel that the cost of maintenance is quite a substantial item in the ultimate price of gas to be paid by the consumer?

A It certainly is.

Q Now, just one thing that came to my attention, Mr. Swinerton, and that is this, that you stated that your firm would be prepared to construct the line in accordance with the estimates made, and I take it then that your firm would be satisfied with a 5% contractor's profit?

A We would.

Q And do I take it from you that the cost set down, apart from the 5% contractor's profit, are the actual out-of-pocket expenditures?

A That is what we estimate.

Q That is what you estimate.

CROSS-EXAMINATION BY MR. MARTLAND.

Q Mr. Swinerton, when you said "we usually do not locate pipelines," does that refer to both Haddock-Engineers Limited and Pacific Pipeline & Engineers, Limited?

A Correct.

Q And with reference to your evidence about the Allison Pass, I am not sure that I noted your evidence correctly. On which side did you say the slide conditions were the worst?

A On the west.

Q On the west, because I am referring to Exhibit 14 here, page

13, which contains the statement, "The west slope of the Cascades, while a great deal rougher, does not have the slide conditions which prevail on the east side."

A My observation is that it was on the west side.

Q So that you think it is worse on the west side than the east?

A Yes.

Q So you would not agree with that statement in Exhibit 14?

A Well, there are slides on both sides, but I would say the west is more difficult.

Q Thank you.

CROSS-EXAMINATION BY MR. S.B. SMITH:

Q Mr. Swinerton, I would like to ask you a few questions, general questions. I have here a portion of the Edmonton Bulletin, that is a newspaper published in Edmonton, of May 20th, 1950. I would like to read you a few statements from that article and see what you think about them. "'Vancouver Board of Trade has gone on record as saying gas should be brought in by the cheapest means with proper protection for both the Canadian buyer and seller,' Colonel W.G. Swan, President, told the Bulletin." That appears to be a reasonable position in relation to the construction of a gas pipeline, I suggest?

A Well, read it again.

Q "Vancouver Board of Trade has gone on record as saying gas should be brought in by the cheapest means with proper protection for both the Canadian buyer and seller."

A Yes, that sounds reasonable.

Q You would agree that is a most reasonable statement?

A It sounds reasonable.

Q "R. B. Baker, President of Standard Oil of British Columbia, and Vice President of Vancouver Board of Trade, said: 'Every Canadian would like to see the pipeline route laid in Canada. Yellowhead Route would be desirable but the cost of gas in Vancouver is the predominent factor,' Mr. Baker said." In the final analysis the cost of the delivered product is the predominent factor?

A It is to the immediate community that is talking, I imagine.

Q I am not at the moment advocating any particular route, I am just simply asking you questions about your views about the road, you understand that, Mr. Swinerton. Colonel Swan went on, "So long as Canadian users of Alberta gas are protected there seems no reason why gas lines should not go in any direction that is most economical to carry the gas." That is a fair summary of your position?

A It sounds all right.

Q You have selected what you consider to be the most economical route?

A We think our route would be the most economical.

Q Yes, thank you.

(Go to page 647)

CROSS-EXAMINATION BY MR. C. E. SMITH:

Q Mr.Swinerton, if I understood you correctly, the only reason why you people examined and reported on Route A was because of the fact that you were requested to examine it and report on an alternative route to Vancouver?

A Correct. That is, we first selected this other one.

Q Yes?

A And then we were asked to make, in 1949, to make a survey of an all-Canadian route, and make a report on the cost of it.

Q But I say that was the only reason why you considered Route A at all was basically because you were requested to try and find an all-Canadian route and report on it?

A Correct.

Q And aside from that consideration I think you said that anybody that took Route A instead of Route B ought to have his head read?

A Yes.

Q I take it that was aside from having an all-Canadian route?

A I am talking now from the viewpoint of the price cost. There may be political reasons or a national reasons why it should be taken instead.

Q Because of newspaper propaganda, radio propaganda, M.P.s from Calgary and everything else of that kind? You do not know probably to what that has reference?

A No, I do not.

Q I have a brother who is an M.P. down there. But apart from the all-Canadian route basis, there is no doubt in your mind and it is your firm conviction that Route B is the best route?

A I think it is from every viewpoint, the cost, market and maintenance.

Q You think it is from every viewpoint, cost, market and maintenance?

A Yes.

Q And, of course, from the viewpoint of producers of gas here and the consumers over there?

A Yes. The more they can sell the better.

Q Thank you.

....

CROSS-EXAMINATION BY MR. D. P. McDONALD:

Q Mr. Swinerton, just tell me this, have you any reports of the nature that we have in regard to the Yellowhead Pass route.

A No.

Q So that when you are talking about cheaper and lower maintenance, you are talking about A, B, C, D, & E routes?

A Yes.

Q And this F Route is not within the purview of your company?

A We have never been asked to do it to date.

Q So that this question of the F Route is not in your knowledge?

A No, and I am not competent to discuss it.

Q You are not competent?

A No.

Q Thank you very much.

Q MR.NOLAN: Mr. Swinerton, have you been asked to do a survey of the Yellowhead route? Has your firm or firms been asked to undertake that work?

A No, not to my knowledge.

Q MR. D. P. McDONALD: Just one more question, Mr. Chairman, I am sorry. Did I understand you right that this was the first gas pipeline that your firm has located?

A No.

Q You have built others?

A Really we did not, but we have taken and saved money for our clients by changing the lines here and there and improved their location. I feel more competent than the average engineer in laying out a line.

Q All right, thanks.

THE CHAIRMAN: Thanks, Mr. Swinerton.

MR.SWINERTON: Thank you very much.

MR.NOLAN: Now, sir, with the permission of the Board, I am going to bring Mr.Slipper back. There are a few things that he is to be asked about by counsel, and I am anxious to complete his evidence because that forms the first phase, and I think we should get it behind us. Mr. Slipper, please.

....

STANLEY E. SLIPPER, recalled, having already been sworn, examined by Mr. Nolan, testified as follows:

Q Mr. Slipper, you are still under oath?

A Yes.

Q And you have come back to answer questions which any of the counsel interested may put to you?

A Yes.

....

CROSS-EXAMINATION BY MR. C. E. SMITH:

Q I take it that the others are finished. If that be so, I have a few questions to ask Mr.Slipper. You, of course, remember your are still under oath, Mr. Slipper?

A Yes.

Q You realize you are still under oath?

A Yes.

Q And, of course, you are familiar with the Act under which this application is being made?

A Yes.

Q Pardon?

A Yes, I am.

Q And you know, of course, that the Board has what we might call a dual responsibility,one towards the applicant and one towards the people of the Province of Alberta?

A Yes.

Q You understand that?

A Yes.

Q And they are both very high responsibilities?

A Yes.

Q You will agree with me?

A Yes.

Q Because, according to the Act, not only does the Board have concern with the effect of utilization of gas which, I suppose, might include export, you will agree with that?

A Yes.

Q But also has a duty with respect to what we have been calling protection of Alberta residents?

A Yes.

Q And in order to properly do their duty you will agree with

me that they want to do everything humanly possibly to get at facts?

A Yes.

Q When I say "humanly possible" I realize with respect to gas facts in the ordinary sense may be hard to find sometimes, is that correct?

A That is correct.

Q Now, you have used the expression in your submission "proven, probable and potential". I remember Mr.Fenerty asking you some questions about those, but, nevertheless, notwithstanding that, I want also to ask you something. If I understood you correctly, I think on the first morning of the Sittings, when Dr. Govier examined you very briefly, Mr. Slipper, you then had, in my opinion, three categories, namely, proven, probable and potential. Do you remember the discussion you had with Dr.Govier?

A Yes, that is correct.

Q And if I understood you correctly, subsequently you wanted to combine proven and probable, and make it one category as you have done in your summary?

A Yes.

Q And make another category for potential?

A Yes.

Q I am going to ask you the question, I think Mr. Fenerty asked you the same, if you will distinguish for this Board proven, probable and potential? First, take proven?

A To me proven, probable and possible are technical jargon. Proven assumes too much. It is an absolute term. I do not believe that you can state any estimate made of underground resources on a Province-wide basis as being proven. On the

other hand possible is a word that assumes too little precision in the matter. Almost every square mile in Alberta is possible gas land. I mean, you have source rocks and reservoir rocks under nearly all of Alberta. And it is merely possible, you can say, that there is gas under it, so that I consider the word "possible" as used in this technical jargon means more than just merely possible.

Q Well, Mr. Slipper, this technical jargon is yours, not mine.

A I am using it because it is being used as all these reserves are presented.

Q Well, certainly, you will agree with me in this, that in the words themselves "proven" and "probable" are not the same thing? The ordinary meaning of the two indicates that?

A That is right.

Q There is no doubt there is considerable difference?

A Yes, there is no doubt there is considerable difference.

Q I will put it to you that "proven" we consider as something, if it is proven it becomes a fact, when it is proven, is that a fair way of putting it?

A Yes.

Q And "probable" is something that is likely to become a fact when proven subsequently?

A Yes. What I tried to indicate in a note that I had in here is that I consider that the term is a rough definition.

Q Page what?

A I am sorry, Page 13.

Q Yes?

A I mean to say, is a rough division of different types of probability. They are, proven and probable, are gas

reserves, are defined as estimated with high probability. That is my definition of proven and probable.

Q Well, you will agree with me that there is a distinction between something that is proven and something that is only probable?

A Certainly. And I object to the use of the word "proven", but I have to stay with the normal usage of the word in the technical sense.

Q Is it because somebody in the Dinning Commission used this expression "proven and probable", is that why so many people are following it?

A Oh, no.

Q Would you like to use another one?

A If you are dealing with a single deposit or a single gas reserve I think that the three terms are more or less useful, but when you are dealing with over-all conditions, to place a group of estimates under proven, under probable and under possible, is an extremely difficult thing to do.

Q It may be difficult, but will you have a try at it? Refer to Page 28, Mr.Slipper?

A Yes.

Q Your summary?

A Yes.

Q And I will come directly to what I have in mind. Under a single heading "Proven and Probable" you have got a total of 5,042 MMMcf?

A That is right.

Q If you do not want to divide that into say 2000 and 3,042, or something like that, to give me proven and probable and others, will you give me a percentage approximation, Mr.

Slipper? Would you say, or would you, at least, consider 50% or approximately 50% as proven and the balance as probable, something of that nature? Can you help me in that way?

A Yes, I will try to do it.

Q An approximation?

A But I do not consider - I consider the way I have put it here is more intelligible. However, I will see about that. I will say that of this gas there is about 2400 of that proven and probable that could be estimated as proven.

Q And the balance?

A And the balance as probable.

Q I am taking it that you are just giving me that figure because I have asked you to do it?

A Yes, that is right.

Q And if after considerstion during the course of this Hearing you come to some other conclusion, would you mind letting us know?

A Yes.

Q But roughly that is it?

A Yes, roughly that is it.

Q Well, we have got that far at least. Now, with respect to your estimate of reserves, and referring directly to the same summary at Page 28?

A Yes.

Q I take it from those totals there would have to be deducted something like 10 to 20% for such things as shrinkage, use of gas in the field and plant?

A Yes.

Q I suggest 10 to 20, because, if I remember Dr. Knauss, in his report on reserves, I think his deduction varied from

about 10% to 20%. If I am wrong, somebody here will certainly correct me. I take it that would be it approximately?

A This is raw gas, sir. I am speaking of raw gas. I am not discussing gas after it is treated.

Q And there is no deduction whatsoever?

A No deduction.

Q In your report, which is Exhibit 4?

A That is right.

Q Now, I have one or two other matters that were considered when I was in the Appeal Court. Will you refer to - oh, one other thing. You gave some evidence with respect to what I will call the one-well theory, if I may use that phrase?

A Yes.

Q I think Hume and Knauss both have used it, and you prefer not to use it in forming estimates of reserves?

A Yes.

Q If I understand you correctly, Mr.Slipper, it is just a preference of yours not to use it because you feel that basically you have not enough data when you have only got one well?

A That is correct.

Q And you do not suggest by any means that it may not be at least an approach to ascertain some estimate of reserves?

A Oh, I say that it indicates a gas reserve,but I have not enough information to give any quantitative figure of it. That is my opinion.

Q I think we have heard it said before that some people have the idea that this one-well radius, mile radius, insome places it might be far too large, and in other places it

might be too small. You agree with that to that extent?

A I will agree with it to this extent, that one well obtaining gas may indicate a field of one trillion cubic feet, or it may just indicate a few million feet.

Q Or it might be an Elk Pointer, if I remember right?

A Yes.

Q You know what I mean, the well that is in your submission?

A Yes, I located it.

Q But on the whole it is fair to say that these other gentlemen were trying to help the Board in going on a one mile radius, and you wouldn't say that they are wrong?

A No, I cannot.

Q Now, coming to the 400 mile tract, and having said what you have said about your figure of not giving it on a one-well basis, I do not understand how you can give this figure of 4 trillion cubic feet for this long 400 mile tract when there are only two wells, if I follow you, or your submission, in the 400 mile distance?

A Yes.

Q And do you remember what I am talking about?

A Yes, I know exactly.

Q You did give us an estimate for that?

A In the Foothills we have a structural condition which you can follow and upon which you can base estimates when you have only a certain small amount of actual discovery. For instance, as I have mentioned in here, you take Jumping Pound, and there are two or three wells on it on a structure.

Q Let us stay north of Jumping Pound?

A Well, I am giving you an example of what I mean.

Q All right?

A We use that and we can come to a fairly intelligent estimate of the reserves in Jumping Pound. In the same way with the whole Foothills belt, there we can take the structural trend and the knowledge that some wells have been found in there, and the knowledge that there has been gas, that there is gas indication, that there are gas indications all along that trend. There is sufficient evidence of the presence of gas down there for me, at least, to think that I am able to give an estimate of the gas, the gas reserves along that belt. Now, out on the prairies with one gas well without any structure, with no knowledge of what the conditions are, except the formation in which it comes and since many of those formations, particularly the Lower Cretaceous, are notoriously very limited in their extent, I feel that we cannot choose a one-well estimate, or take a one-well estimate.

Q But you do feel that you can give an estimate....

A For this Foorhills belt.

Q For this large area?

A Yes.

Q Because of what you call a structural what?

A Structural trend.

Q Is this some observation of your own?

A Yes.

Q Through a good portion of this country?

A Yes.

Q Imean, you have actually been up there and looked at it, so to speak?

A Yes.

Q Did you have any other information to assist you by way of

this, what is the word I want, where you fire off charges?

A When I did that?

MR. S. B. SMITH: Seismographic work?

Q MR. C. E. SMITH: This seismographic work?

A My observations have been made over a number of years.

Q Did you have any of this seismographic work?

A No, I had no seismographic information.

Q Do you know of any company, big or small, or any companies that have done anything of that kind, that kind of work north of the Jumping Pound field, and along the Foothills?

A Yes, the Home Oil have done some work all along there.

Q In this area, in those 400 miles?

A In part, yes.

Q Anybody else, do you know?

A No, I do not know.

Q In any event, you have given us the explanation of how you arrive at that?

A Yes.

Q And you have put that into what you call the potential, those 4 trillion cubic feet?

A That is right.

Q And there is no other information that is available, as far as you know, with regard to that that you have not mentioned to me?

A That is correct.

Q With respect to this portion?

A No, that is right.

Q Now, will you just look at your submission, Mr.Slipper, and I want to ask you a layman's question. You may laugh at me for it, but I want to find out the answer. At the

bottom of Page 5 you say this, it has reference to the Milk River formation, yes, that is right, and you say this, "There are a few localities where gas has been found in the beds of Group 4 above the Milk River formation. One such is west of Warner in Township 4", etc., "and there are old gas wells at Wetaskiwin and Camrose. One of the interesting high gas occurrences is that from the well in East Calgary, which supplied the first gas used in the City. Drilled in 1909, it has been in use in a small way ever since." Now, as a poor layman, and I might say a poor layman like myself wonders, and I am going to wonder out loud, why in the world the City of Calgary could not have quite a few of those small wells, and they are close enough to home to start with, and we can get gas out of them. What has prevented us finding out, do you know?

A Well, they are very small gas wells. They would cost quite a bit per foot.

Q "Interesting high gas occurrences" there you say?

A Yes. The word "high" would probably be better if "shallow" gas occurrences was used.

Q I take it that, from your knowledge, there must be some reason as to why some effort has not been made in the past to see whether Calgary could not get gas right in its own backyard. Do you see what I mean? What is to prevent that?

A Nothing at all. I mean, it is quite possible to get gas near Calgary.

(Go to Page 660).

Q I am interested in finding out if anybody has tried to accomplish that around here?

A That well was drilled by Mr. A. W. Dingman. There have been some wells drilled down near Midnapore which have not been successful in getting any gas. There was a well drilled at Crossfield - I am assuming everybody knows how close these places are to Calgary - there was a well drilled at Crossfield a few years ago which obtained considerable gas but not enough to make it economic.

Q Do you know this particular little well yourself?

A Yes, I know it.

Q Can you tell me whether it would not be good business to test the potentiality or possibility of having several wells like that, to feed Calgary its gas from its own back yard?

A No, I do not think so.

Q Why cannot it be done?

A Because you cannot develop enough gas wells.

Q You mean drill enough wells to get enough gas?

A That is right. These wells are only capable of producing half a million cubic feet per day.

Q Yes, but they are awfully cheap drilling at that depth?

A Yes.

Q We will leave that. I wondered why somebody had not found out something about it. Now, just the odd question, and I hope I have not been referring to something that has been gone over before. On page 9 at the top of the page, Mr. Slipper, you adopt Hume's figures for the Pendant d'Oreille but Foremost you get 13 MMMcf. (Slipper). How did you arrive at that?

A I have not got that information with me, sir. I made that estimate quite a number of years ago when the field was being utilized by the Gas Company and when I was in the employ of the Gas Company.

Q Then you give that figure from information you yourself have personally secured some time ago?

A Yes.

Q And are familiar with the field yourself?

A That is right.

Q If the Board should require any of your working papers, could they be made available to it?

A Yes, sir, they could be.

Q Now, I refer to the bottom of page 10 and you say this with respect to the Provost field: "The Provost field is a typical Viking Sand gas field. It is supposed to be outlined by dry holes. The Imperial Oil Company's estimate of 100 MMMcf. is accepted." Now, on the occasion that you use this expression "is accepted", I take it you mean "adopted" as if it were your own?

A Yes.

Q It is not just because Imperial Oil or Hume says that that you just say O.K. and take their word for it. You really adopt their figures?

A Yes.

Q And you make it your own?

A Yes.

Q And you say "The area of the field is about 40 square miles." I am wondering this, I am suggesting when the Imperial made the estimate of 100 MMMcf., that they did so on the

basis of about 80 square miles and that subsequently they reduced their acreage, cut it in half and also cut their estimate in half to about 52 billion?

A I was not aware of that.

Q I am not stating that as a fact but I understand that is correct. You would have an opportunity of finding that out?

A Yes.

Q And will you do that?

A Yes, I will.

Q You see what I mean. They had about 80 sections and when they gave up about 40 their estimate of reserves is also correspondingly reduced. You will find out if that is correct?

A Yes. May I turn that in to the Board here?

Q You will be available, if we have to cross-examine you at any time?

A Yes.

Q If you let counsel know, or me know, I will be glad to see that the Board gets this information at the proper time and place. Now, turning to page 11, Mr. Slipper. With regard to the Viking-Kinsella field you say: "My estimate of proven reserves is some 700 billion cubic feet down to 200 pounds base pressure." Can you give us your reasoning for that, or be of any assistance to us as to how you arrive at that figure of 700 billion?

A In making that estimate of 700 billion, I can give you the figures on that if you wish. I have the working notes here and I can present them when I present the others.

Q If you can put it in table form I think it would assist us, to show how you arrived at that information, what work you did and what method you used?

A Yes.

Q Now on page 12, at the top of the page, referring to the Morinville area - I do not know whether you have explained this before or not, you say "There have been some more recent Viking discoveries that are not included here. It is possible to include these wells in an area of supposed Viking production of about 120 sections and if it is assumed that there are about 2 billion cubic feet per section, then there may be some 240 billion cubic feet of gas reserves. This figure is offered but cannot be defended since there are no data presenting proof of continuity of a gas reservoir over the area." First, how do you arrive at your area of 120 sections, Doctor? But I should not call you "Doctor".

A That is all right. The figure of 120 was arrived at by me by plotting wells on a map, plotting the contours and showing certain boundaries and I call it 120 sections.

Q You mean from some information with respect to wells, you work from that to an extended area and you figure about 120 sections?

A Yes.

Q I take it that of necessity would have to be, or might be very much of a plus or minus situation?

A That is right.

Q And as to the content, how do you arrive at that? "If it is assumed that there are about 2 billion cubic feet per section."

A I was using an estimate that the sand was about 9 feet thick

and I was using my Viking-Kinsella figures of about 2 billion feet per section for the over-all reserve figure for the Viking Sand.

Q In other words, with the knowledge you had of the Viking-Kinsella field, you assumed the same condition in Morinville?

A Yes.

Q And that is where you got this 2 billion cubic feet, because that is what you applied to the Viking-Kinsella?

A Yes.

Q Is that a fair way of putting it?

A That is right.

Q O.K. So much for that. Now on page 13. You are there dealing, at the top of the page, with the Viking in the Redwater field and you refer there to a content of 1 billion cubic feet per section. How do you arrive at the 1 billion there?

A I use the 1 billion because the sand there is, as far as I could get information on it from electrologs, thinner than it is at Viking by about a half and I assumed that the reserves in a section would be about a billion per section.

Q That still is based on your information with respect to the Viking-Kinsella field and applying it to a thinner bed, shall I say, of sand?

A Yes, my general knowledge of Viking-Kinsella gas horizons as I have studied them throughout the central part of the Province.

Q And for a layman like me you probably figure it would be half as big and therefore would contain half as much?

A Yes.

Q Is that how we get that 1 billion feet?

A Yes.

Q On page 17 where you deal under the heading of "Edmonton and North", near the bottom of the page, and without reading the whole paragraph - it has been read here before - "In order to obtain an estimate with a numerical value, I used as a guess a saturation of 50 million cubic feet per section and obtained an over-all gas saturation of about 5 trillion cubic feet," and then you go on and deal with the 5 to 1 ratio of dry holes?

A Yes.

Q Upon what did you make your guess of 50 million cubic feet per section?

A Just a guess.

Q Did you have any assistance like you had with the Viking in the Viking-Kinsella field?

A No, with the exception of this that I have had quite considerable to do with drilling wildcat holes north of Edmonton. Most of these exploratory wildcats I have found quite gassy zones, that the lower Cretaceous is a quite gassy zone in those areas. None of them I had anything to do with produced export gas. Still there was considerable gas in the zone, so I just took a figure of about 50 million cubic feet as representing the gassy condition in the zone.

Q I am not being critical because you are careful enough - I should read the latter part of the paragraph, I think, seeing I have brought it to your attention. You say, "It is recognized that this type of guessing should be classified with a low degree of probability. With the wide spacing

of wells that prevails it is as yet unsafe to assume extensive continuity of reservoir or reservoirs in this region."

A Yes.

Q And I take it you have said exactly that?

A I tried to explain exactly the rather wild guessing that I did in arriving at this.

Q You are fair enough to say so here?

A Yes.

Q Certainly that could not be construed as proven. You will go that far with me?

A No.

Q At page 18 there is a reference to Pouce Coupe area?

A On page?

Q Page 18. How do you pronounce it, Pouce Coupe or Pouce Coupe?

A The way they pronounce it up there is Pouce Coupe.

Q Then we will stay with the natives. You say this, "Some gas has been proven in the Pouce Coupe area of Alberta in the Lower Cretaceous. Three wells in the Gates Sandstone have proved a gas reserve of about 100 billion cubic feet." Would you expand on that a little. What do you mean that these three wells have proven this?

A A company called the Peace River Natural Gas Company drilled three wells called Peace River Natural Gas No. 1, 2 and 3.

Q Did you have something personally to do with those wells?

A Yes, I located them and was working for that company at that time.

Q Yes?

A And those wells were spaced so that they proved about 100

billion cubic feet of gas.

Q I take it you yourself would have considerable information with respect to those wells?

A I do not know whether I would be free to give that to the Board without permission of the company.

Q If it was very important I might summons them, and if they did not come I would have to send a policeman?

A As a matter of fact I have not had any detailed information about it.

Q You have not any?

A Not any detailed information, and if you wanted the details of it you would have to get it from the company.

Q And your 100 billion cubic feet, is that from memory of what you found before?

A That is from memory, yes.

Q So that presently you have not even the working figures that could be applied?

A No, I have not.

Q On page 21, I just want to refer you to one expression here. At the very bottom of page 21. You use this expression, "The total reserves of Turner Valley have been estimated at about 1,700 MMMcf. with some 254 MMMcf. of this amount remaining as marketable."

A Yes.

Q I am not worrying about Turner Valley but I am a little concerned about your use of the word "marketable". I wondered if you would expand on that and explain it for the assistance of the Board. First, let me ask you this, where you use "marketable" and "pipe line gas" are they

synonymous?

A No. No, I should have used the word "recoverable" there.

Q Are you sure now that you did not intend to use the very word you have?

A No, I am not dealing with markets. I am only dealing with gas that is recoverable.

Q And you would prefer to have that changed, is that what you mean?

A Yes.

Q I would have preferred if you could have given us some assistance in the use of this word "marketable", but I am afraid you have stymied me?

A I should not have used it.

Q You prefer to use the word "recoverable"?

A Yes.

Q And what do you mean by "pipe line gas"? You used that expression in one or two places?

A I think that was in the case of the Leduc field.

Q You did use it there, yes.

A Yes, I meant there that there would be a pipe line to take gas from the other horizons and that this gas where, if it were by itself, would not be usefully used, but where it is in the same field where gas is now or would be taken from it also could be put into the pipes.

Q Does it mean anything more than gas that eventually gets into a pipe line?

A That is all it meant to me.

Q Anything to do with the cost of getting it there or the question of deliverability or anything of that nature?

A No.

Q In other words, it does not help us any more than to say in your opinion there is gas there and if it gets into a pipe line it will become pipe line gas?

A Yes.

Q That is as far as we can go with you?

A That is right.

Q Now with regard to Pincher Creek on page 23, Mr. Slipper. The information, I take it, was information that you received either directly or directly through people that are operating the Pincher Creek field, if we could call it that?

A Yes, that is so.

Q And that would be - -

A The Gulf.

Q That is the Gulf that has wells presently there?

A That is right.

Q There is one word I did not understand on this page, and that is near the bottom of the page. Maybe you have already been asked this. What is "induced porosity", Doctor? Probably it is explained on page 22 and I could guess, but I am not sure.

A Porosity. Ordinarily we use the word Primary porosity or native porosity of rocks, consists of voids between grains of sand. That is the primary porosity. But if that rock is subjected to pressure or crushing or tension, it will break, fracture, and it is those openings that are caused by such stresses that I call "induced porosity".

Q Such as may be caused by fracturing?

A That is right.

Q That is good enough for me.

A That is right.

Q And I think on page 22 you indicated that but I was not too sure just what it was.

A I think so.

Q Now with regard to what is called Brazeau. No, I will not continue with that. I dealt with that earlier. Page 26. Will you refer to that and Princess under Devonian. You see about the middle of the page, page 26?

A Yes.

Q Or one-third of the way down. You say this, "My estimate of the reserves of Devonian gas in the Princess field is 48 MMMcf."

A Yes.

Q I suggest to you, Mr. Slipper, that you may be cutting yourself in half if you like Dr. Hume's figures?

A I did not use his figures in that case.

Q In any event he gave a figure of about 87 where you give 48?

A Yes.

Q And you prefer to reduce it in any event?

A Yes.

Q That is one case where you will not accept it, you will curtail it by half?

A Yes.

Q I think I am right in saying that he did give a figure of about 87?

A Yes.

Q I wanted to be sure you were aware of that as we went along. And by the same token I think Medicine Hat is in a similar

category. If you look at the top of page 27.

A Yes.

Q You remember you gave about 107 MMMcf. for Medicine Hat?

A Yes.

Q And I think Hume gave about 250?

A His original estimate he gave 107 and then he corrected it to that other figure that you mentioned.

Q About 250?

A Yes. I prefer his first figure.

Q You prefer to hang on to the 107?

A Yes.

Q And when you are doing that, you are pretty familiar with that field?

A Yes.

Q And have been during the course of years?

A. Yes.

Q But you are aware that Hume did give a 250 figure where you still maintain the 107?

A Yes.

Q I wanted to make sure you had knowledge of that, so that if you wanted to correct anything you could do so. I do not know whether you have been asked this, on page 27, you say something that gets a little close to home to me. You say, "According to advice of Conservation Board engineers the recoverable solution is about 340,000 standard cubic feet per acre foot."

A Where is that?

Q On the top of Page 27, talking about Golden Spike?

A Oh, yes.

Q Whatever information you got, do you yourself agree with

the figures that are quoted here? It is put in such a way as if to say that you have accepted the information that you got from the Board's engineers?

A Yes, sir.

Q Are you of that opinion?

A Yes. My opinion is that information is absolutely right. It is what I agree with.

Q In other words, you can form your own opinion and so state it in the same language you state this?

A Right.

Q I think there is one other thing at the moment. If you refer to your summary on page 28, the first of the last paragraph, you say "It should be stressed that 7.586 MMMcf. of the estimate is gas which is or will be tied into the production of oil and gasoline." I think I understand what you mean but how do you get at that figure?

A I added, if you will look at the summary of gas reserves in Table 6, it is found there. I added the Proven and Probable Carboniferous, 2,457; the Proven and Probable Devonian, 920 and the Potential Carboniferous, 4,000 and Potential Devonian, 209 and it adds up to 7.586.

Q It is the total of both categories for Carboniferous and Devonian?

A That is right.

Q And that is where that actual figure comes from?

A Yes.

Q Just tell me why that be so, Mr. Slipper? What is the significance of these wells in the Carboniferous and Devonian which makes you say, "It should be stressed that this is an estimate of the gas which is or will be tied into the

production of oil and gasoline."

A So far all our fields obtained from these two systems of rock have been condensate, gas condensate fields or gas and oil fields.

Q It is because of the experience in the past you assume that this total should be considered in that category?

A That is right.

Q By the way, one thing I forgot to ask you. Would you expect to get in your 400 mile tract - I am using rough figures when I use 400 - what type of gas do you hope to get, condensate?

A Yes, condensate, they would be oil fields and gas condensate fields, just exactly - -

Q You would pretty near have to get something like that in order to pay for these expensive deep wells?

A Yes.

Q Do you think anybody would go out in that area and drill for gas alone?

A If he could get enough for his gas.

Q That is what I have in mind. You heard some evidence about them paying no more than 30 cents down in Portland and Seattle. It would be a long time before anybody would want to drill any field along the foothills. Don't say agaih if you get enough money you will do anything, naturally.

A I do not know anything about that.

Q You cannot give us any help along that line? One thing is true that it would be much better for everybody concerned if your 400 mile tract was a condensate field or something of that nature?

A Yes.

Q They would be expensive wells?

A Yes.

Q What would a well, similar to the ones in Jumping Pound, cost to drill, do you know? Three or four hundred thousand dollars?

A It would cost more than that, I think.

Q Probably half a million?

A Probably.

Q That is roughly?

A Yes.

CROSS-EXAMINATION BY MR. S. B. SMITH

Q Now, with respect to Pouce Coupe area that you refer to, can you tell me is that land in Township 80, Range 13, West of the 6th Meridian?

A That is correct.

Q In the Province of Alberta?

A That is correct.

Q Then the land you describe on page 18 as the Lower Cretaceous in the Pouce Coupe area is the area from which Westcoast Transmission Company is seeking leave from this Board on the 20th of June to export to Dawson Creek, British Columbia?

A I do not know anything about that.

Q There was a notice in the paper last night?

A I did not know anything about it.

THE CHAIRMAN: That is all, Mr. Slipper. Possibly we might adjourn.

(At this stage there was a short adjournment.)

DAN S. GOODBODY (recalled) already sworn, examined by Mr. Nolan, testified as follows:

Q Mr. Goodbody, you are still under oath?

A Yes.

Q There was a short discussion this morning with Mr. Swinerton about the slide country in the vicinity of the Allison Pass?

A Yes.

Q You were here?

A Yes.

Q You heard that discussion?

A Yes.

Q And you heard Mr. Swinerton say that in his opinion there was somewhat more slide condition prevailing on the west side of the Cascades than on the east side?

A Yes, I heard him.

Q Perhaps I might refresh your memory with what you said yesterday in examination-in-chief when I was directing questions to you about the slide conditions, and I am reading from page 619,

> "Q. Now, you have spent a good deal of time in this Allison Pass area, haven't you?
>
> A. Quite a bit.
>
> Q. You have seen what goes on there in winter and in summer, have you?
>
> A. Yes.
>
> Q. And what have you seen?
>
> A. Well, the snow was kept off the road this last winter, but last year they were given a great deal of trouble with slides going up the east slope and

> " this year - - I would like to correct this a little bit, down just east of Hope they are having a great deal of trouble with the little slides down there. That has developed into quite a bad place."

A That is correct.

Q Now, would you just elaborate on that for me, please?

A Well, the road was cut through a gravel bank in there and when we went over it originally the cut was there but they were not having any difficulty with that particular section. Last fall they had their first slide, a small slide came down, a small slide in length.

Q On which side?

A Down near Hope, on the west side of Allison Pass.

Q The west side, yes.

A And took away, oh, half of the road there and it has developed on to, I imagine, a slide which now must be three or four hundred feet long.

Q My point is this, there has been a change in the nature of the slide country since your report, Exhibit 14, was written?

A The country is the same. I missed it on the first time over. It was something I missed when I took my notes originally.

Q In any event, do you agree or do you not with what Mr. Swinerton said?

A Yes.

Q You do?

A The slides, there is a bad slide on the west side.

Q So that there is slide country now on the west side of the

Allison Pass just east of Hope?

A That is correct.

Q And when in your report you make the observation that the west slope of the Cascades, while a great deal rougher, does not have the slide conditions which prevail on the east side, that has to be read in the light of our new experience and what you have more recently seen?

A Yes. I might say that in my opinion the slides on the east side are spread over a greater area, not as much as the one that occurs over on the west side near Hope, and I think that my submission should be taken in that light.

Q Now, there was another sector I want you to elaborate on. It is on page 14, Hope to Bridal Falls (28.4 miles), and there is a statement in there. I will read the whole paragraph, it is very short:

> "From Hope the line follows the highway to Bridal Falls. Some places along this section are extremely rough and rocky. The only available shelf between the mountains and the river is narrow. The highway and the railroad now occupy this space. In low places the pipe will require anchoring against heavy floods."

That sentence: "The highway and the railroad now occupy this space," would you elaborate on that for me?

A The present construction going on there, the Highway Department are building a retaining wall between the railroad and the highway in order to maintain their fill and they are not disturbing the existing mountain, they are leaving it in place and building the road out. That entire area that

is available there is consumed by the highway and the railroad.

Q Well now, when you broke off yesterday, Mr. Goodbody, we were going into a description of the route from Columbia Gardens, British Columbia, to Spokane, Washington, on page 17 of your brief?

A Yes.

Q Under the heading of "Alberta Natural Gas Company". Now, would you please take up the narrative at that point and continue as you have been doing?

A Columbia Gardens to International Border - (4.2 miles)

This route will parallel the existing road which requires widening to accommodate heavy construction equipment. All earth that is removed in this section will have to be hauled away as the Great Northern Railway is below the proposed route. The line will cross the border at Waneta, British Columbia.

Northwest Natural Gas Company

International Border to Smackout Pass - (20.1 miles)

In this section the line extends easterly to Deep Lake and parallels the road on to the pass. A steep bank near the border will require some grading for equipment.

Smackout Pass to Blueslide - (17.8 miles)

The line proceeds easterly from the pass to Ione and then follows the highway to Blueslide. Some ledge rock will be found on the south slope of the pass, but the remainder of the distance to Blueslide is gravelly soil.

Blueslide to Newport - (32 miles)

The terrain between Blueslide and Parker Lake is rough, little clearing will be necessary, but some rock excavation will be required. The route follows the highway to a point south of Usk and then southeasterly along the ridge to Newport. The terrain near the road is flat with some land under cultivation near Usk. Pipe anchors will be required as this area has been flooded.

Newport to Spokane - (36.9 miles)

From Newport the pipeline route extends south and southwest to a point two miles east of the Spokane River. While this route has been selected to avoid the rock near Diamond Lake, basalt will be found along sectors near the highway, but this condition disappears as the line enters cultivated farm land along U.S. Highway 195. The line parallels this road to the Wallace Airport and then the Inland Empire Highway to a point near Chatteroy. The terrain is flat and covered with Jack Pine; some wet ground (3/10 of a mile) will be encountered in this section. The terminus of this lateral will be several miles west of Chatteroy depending on the location of city gate measuring and regulating station of the Spokane Gas & Fuel Company.

COST OF CONSTRUCTION

The cost estimates for Route A have been prepared on the same basis and with the same attention to detail as those for Route B. The extra $20,000,000 is due primarily to the mountainous nature of the route and the longer (3 year) construction period. Invisible

items included are Contractors' Fees - 5%, Interest During Construction - 8½% (based on 3-5/8% interest charge, 75% debt coverage and a three year construction period), Engineering Supervision - 4% and Overhead During Construction and Preliminary Expenses - 4%.

Q Well now, we should look at the Tables, Mr. Goodbody. Now, tell me if I am right, the first table which is entitled Summary of the Estimated Construction Costs is the cost of the whole system from Pincher Creek?

A The first Alberta. The entire sheet is the cost of the entire system including the grid.

Q So that we have the three companies with the line that each of them will manage and control. First of all, the Grid Company. That is the gathering system that we had explained to us on a map here?

A Yes.

Q The first of your maps, that is the grid system, and that has an estimated total cost of $34,789,070.00?

A That is correct.

Q And the Alberta Natural Gas Company, and that is for transmission within the boundaries of Canada, isn't it?

A Yes, that is correct.

Q It has an estimated total cost of $73,976,782.00?

A Besides the transmission lines that also include the sales laterals within Canada.

Q I was coming back to that. Then the Northwest Natural Gas Company, which is the company that will take delivery at the border, has an estimated total cost of $21,952,937.00, making a total estimated cost of $130,718,789.00?

A That is correct.

Q Now, the tables which follow are put under the various company heads, are they not?

A Yes, that is correct.

Q And the first one, the Alberta Natural Gas Grid, is the detail of the cost of the grid system?

A That is correct.

Q And that extends over two pages, does it not?

A Yes, over to sheet 2 of Table B.

Q Sheet 2 of Table B?

A Yes.

Q And that figure of $28,439,869.00 is the figure in the first column of your first table, the summary table, which says that the gathering system will cost $28,439,869.00?

A That is correct.

Q That is the very first figure?

A Yes.

Q Now, the next table, that is Table C, deals with the main line in Alberta and British Columbia under the heading of Alberta Natural Gas Company?

A That is correct.

Q And the cost of that in the figure of $58,739,750.00 in our summary table, being the first table?

A Yes.

Q And next we have the estimated construction cost of some sales laterals, that is Table D, sheet 1 of 2?

A Yes.

Q Now, where do I find those?

A That is the first one, sales lateral, and it is under the

Alberta Natural Gas Company and will be found - -

Q It is the Spokane lateral?

A Oh, it is the Spokane lateral. It is 3805.

Q What I am getting at is that these sales laterals are very easy to follow because it describes the lateral we are talking about in words?

A Yes, each one is described.

Q The one on Table D, sheet 1 of 2, lateral line from Columbia Gardens via Waneta, B.C., and Smackout Pass to Spokane, that is right, and that goes on for two pages?

A Yes.

Q And we have their total cost $3,954,997.00?

A That is correct.

Q And where do I find that figure in the first summary?

A It will be divided between those two.

Q It is split between the two companies?

A Yes.

Q Because each will have a portion of the line under its jurisdiction?

A Yes.

Q And then the next sales lateral from Aldergrove to New Westminster, B.C. That is Alberta Natural Gas only and it is Table E. That shows a cost of $1,319,923.00?

A That is correct.

Q And that stands out boldly in the first table of the summary of estimated construction costs?

A Yes.

Q The next sales lateral is Cranbrook to Kimberley, Table F,

with a total of $242,229.00, and the next is a short lateral to Pincher Creek, table G, with an estimated total cost of $24,321.00?

A Yes.

Q That is right, isn't it?

A Yes.

Q Now, the next table, Table H, is the breakdown of the construction costs of the main line in the United States?

A That is correct.

Q And that would be under the Northwest Natural Gas Company, and that is a total of $13,259,802.00?

A Yes.

Q Table H. And we find that on your summary table, Table A, under the heading Northwest Natural Gas Company main line?

A That is correct.

Q Then there is a sales lateral on Table I to Renton and Bothel, Washington. Those are two laterals?

A Those are two laterals. Those are taken off Seattle. It is actually Seattle. One runs from Renton to Seattle, the other from Bothel to Seattle.

Q And Table J is the lateral to Tacoma, Washington, at a cost of $286,601.00, and then there is a lateral on Table K to Everett, Washington, which costs $94,351.00, and Table L is the lateral to Centralia, Washington, at a cost of $76,157.00?

A That is correct.

Q Now Table A gathers together the costs of the grid systems and the main line systems and all the laterals and puts them down under the particular company that is to have jurisdiction

over them?

A Yes.

Q And you arrive at a total cost by adding those figures of $112,204,959.00, to which you add the other items of interest during construction, engineering supervision, overhead during construction and preliminary expenses, bringing them up to a total estimated cost of $130,718,789.00?

A Yes.

Q And there is a breakdown in the subsequent tables of all these estimates of cost?

A Yes.

Q They are set out under the headings as they are on Table B, surveying and mapping, right-of-way and damages, materials, coating, valves, access roads, installation costs and so on and so on and so on. I do not think, Mr. Chairman, that we will add very much by reading those detailed tables. I did want the Board to know how they were made up and that the first one, Table A, is a consolidation of everything contained in the succeeding tables, and I think they are quite easy to follow, and of course, if counsel or the Board have any questions they would like to direct as to the various units of cost the witness will be glad to answer. Just to highlight it a little bit, it seems awfully dreary just offering figures, perhaps you will turn your attention to the Princeton to Hope sector. Now, where do I find that?

A That is not subdivided in this.

Q You have not broken down that particular sector so that you could give me the construction costs of that particular bit of line?

A I can give an approximation of the construction costs in that particular piece of line, that is, my estimate of the approximate cost for the 83 miles between Hope and Princeton. It is not in this submission but it is approximately $4,200,000.00. That is for the contract construction costs for that particular work.

MR. C.E. SMITH: Would that be a portion of your $58,000,000.00?

Q MR. NOLAN: Is that included under the heading Alberta Natural Gas Company main line $58,739,000.00?

A That is included in that.

Q On Table A?

A Yes.

Q That estimate that you are giving me now is contained in that table?

A That is included in that table.

Q Well now, I am going to ask permission of the Board at this moment, if I may, to proceed to read the brief Route B. I do that because they are comparative and because one refers to the other and the other refers to the one. It would be more convenient, I feel, if we concluded the reading of these two documents and make the witness available for cross-examination on the whole so that cross-examination would not be impeded by talking about the later route about which no information or evidence has been given, if you follow me, sir. We should put in all our evidence on routes, then all of the cross-examination can take place at once. So if you will, sir, we will take up now Exhibit No. 15, which we are going

to call Route B. We will read the introduction, sir, but I am going to ask, if the Board will permit me, not to go into the description of the route, which is the same in part as the description we have just given insofar as it goes down to Yahk. You see, when you get to Yahk, sir, Route A goes off to the west and Route B goes down south, so we do not have to describe in detail the route to Yahk, but after Yahk we will go into it with the same particularity we have done before. The introduction now, Mr. Goodbody.

A

DESCRIPTION OF ROUTE
and
ESTIMATED CONSTRUCTION COST

(ROUTE B)

INTRODUCTION

This exhibit has been prepared by Haddock-Engineers, Limited, and Pacific Pipelines & Engineers, Limited, of Los Angeles and San Francisco, at the request of the applicants. It contains a description of the Grid System and of the best pipeline route, from an engineering standpoint, from Alberta to the Pacific Coast.

During the summer of 1947 Mr. A. Faison Dixon made extensive aerial and ground reconnaissance surveys of many potential sections of British Columbia and Washington. Then in 1948 we, Haddock-Engineers Limited and Pacific Pipeline & Engineers, Limited, were retained to make more detailed studies.

Q Mr. Goodbody, would you read a little bit slower, please, you are going very quickly.

A Men were sent into the field to make further aerial and

and ground reconnaissance surveys of the promising areas in British Columbia and Washington. We made a thorough study of the route described herein (Route B).

In 1949 this work was extended to cover four other routes, one of which, Route A, an all-Canadian route from Alberta to Vancouver, B.C., is described elsewhere.

Of these, the one outlined herein was found to be the cheapest to construct and the most economical to maintain. It offers the greatest assurance of continuity of service of any route proposed to this Board.

Also included is a summary of the construction cost estimates for the grid gathering system, the main transmission line and the various sales laterals. Laterals to serve Spokane, Wenatchee, Bellingham and the Lower Fraser Valley are not included as it is expected that these lines will be constructed by the local distributing companies.

The following tabulation is a summary of the total cost of construction of the Grid System and of Route:

Alberta Natural Gas Grid, Ltd.	$ 33,594,595
Alberta Natural Gas Co.,	21,324,997
Northwest Natural Gas Co.,	55,125,862
	$110,045,454

CONCLUSIONS

As a result of field investigation and numerous consultations we have reached the following conclusions:

1. The route through Crows Nest Pass and Kingsgate is the shortest to the largest markets for natural gas in British Columbia, Washington and Oregon.

2. Accessibility from existing roads and the relative regularity of the terrain will be important factors contributing to lower initial construction costs and maintenance expense.

3. A study of reports on weather conditions in southern Alberta, British Columbia, northern Washington and Idaho indicate that the average rainfall and snowfall along this route is much lower than for any other.

4. Due to the open nature of the country along the route, areas subject to landslides and earth movement will be avoidable. This factor, coupled with the existence of constantly accessible roads is of prime significance in insuring the all-important factor of continuity of service.

5. An earlier date for completion of the pipeline can be expected since the favorable conditions mentioned above will permit a longer working season.

6. The initial investment in compressors and compressing operation expense will be a minimum.

7. The lower capital investment and operating expense will result in an economically feasible transportation cost to the North Pacific Coast and consequently Alberta producers will receive the best possible price for their natural gas.

Can we skip this Grid? We read it yesterday?

Q Yes. This only repeats what we have already read to the Board, sir, and then you see the description of the route on page 5.

A

ALBERTA NATURAL GAS COMPANY
and
NORTHWEST NATURAL GAS COMPANY

DESCRIPTION OF ROUTE

A general description of the route is as follows: It starts at Pincher Station at the end of the Alberta Natural Gas Grid, Ltd., gathering system and then runs westerly passing near Cowley and Lundbreck, thence to Blairmore and Coleman, through the Crows Nest Pass to Michel, Natal, Fernie, Elko, Cranbrook and through Yahk to Kingsgate, B.C. All of this section is in either Alberta or British Columbia.

Crossing the International Boundary at Kingsgate the pipeline travels in a direction southerly by way of Bonners Ferry to Sandpoint, Idaho. From Sandpoint the line runs westerly to Newport, Washington, and on to a point near Spokane. It then goes westerly, crossing the Columbia about ten miles north of Wenatchee, then through Stevens Pass to a point west of Monroe, Washington. Here it splits into two sections, one going north, through Bellingham to the International Boundary near Lynden and on to the British Columbia Electric Company system in New Westminster; the southern section of the pipeline system runs east of the main populated areas of Seattle and Tacoma, passing near the towns of Issaquah and Orting and east of

Centralia and Chehalis to Varden. From Varden it travels to Longview and, crossing the Columbia River, enters Portland, Oregon.

The system will serve the towns and cities of Vancouver, Cranbrook, Kimberley and Trail in British Columbia; Spokane, Seattle and other towns in Washington; and Portland, Oregon; together with the communities served by Portland Gas & Coke Company.

Pipeline lengths have been calculated by scaling the best available maps, or by speedometer readings where the country was too rough for accurate measurement by this method. To these distances a factor of 3% has been added to compensate for anticipated vertical and horizontal deviations.

Q When looking at your report, Exhibit 5, I find again that there is a map in the back of the report describing the Grid system, a copy of the one in Route A?

A Yes, the same.

Q And following that is the Route B map. It begins, as the other one did, up at Pincher Creek, doesn't it?

A That is correct.

Q And it follows the same route as Route A did until you get to Yahk Junction?

A That is correct.

Q From Yahk Junction it goes down in the vicinity of Bonners Ferry and Sandpoint to a place in Washington, I think?

A Newport, Washington, yes.

Q Is it in Washington?

A Yes, that is correct.

Q Now, I see there is a lateral running north to Trail?

A Correct, yes.

Q And may I say the main line goes on down then to a point in the immediate vicinity of Spokane?

A Yes.

Q And that main line then goes westward a long way through the Stevens Pass to a point called Munroe?

A Yes.

Q And at Munroe it branches north to Vancouver and south to Portland?

A Yes.

Q And there are a number of laterals off that north and south line to Everett and places like that, which are indicated on the map?

A Yes.

(Go to page 692)

Q And in addition there is a lateral in the centre of the State of Washington to Hanford?

A Yes.

Q And that also shows on the map?

A That is correct.

Q Well, now, we have decided, Mr.Goodbody, that you won't have to read anything you have read before, so we won't require page 7, will we? 7 has been read, hasn't it?

A 7 has been read.

Q And 8 has been read?

A 8 has been read.

Q And 9 has been read?

A Yes, 9 has been read.

Q And then on 10 you go from Moyie to Kingsgate?

A Yes, from Moyie to Kingsgate.

Q Now, you will have to read that, won't you?

A Yes, sir.

Q All right.

A Moyie to Kingsgate - (30.1 miles)

From Moyie the line follows the road and river and railroad through Yahk to Kingsgate. Some parts of this section will be difficult to construct because the valley is narrow. There is, however, sufficient room to avoid, in general, sidehill construction. Access is good from existing highways.

Q Now, this next heading takes us down through the States and back into British Columbia?

A Yes. We are now in the Northwest Natural Gas Company.

Q Yes?

A Kingsgate to Copeland - (14.8 miles)

South from the Border the pipeline generally parallels the highway cutting across country where the distance can be shortened. This is generally in semi-rolling and rolling country, some rock will be encountered near Copeland. It is all readily accessible from the highway. Maintenance will be good for the entire length.

Copeland to Bonners Ferry - (13.0 miles)

From Copeland the pipeline parallels the highway for about 7 miles and then follows a section line, crossing the Kootenai River on a pipeline bridge about one-half mile west of Bonners Ferry. This section of semi-rolling country is gravel and sandy clay, with about 2 miles of ledge rock. For the entire distance the proposed route is easily accessible, and maintenance conditions will be good.

Q Tell me, these sectors that you have divided up. That is only for convenience, isn't it? It is not because there is a particular kind of terrain in that particular sector?

A No, it is just a matter of convenience to separate the areas.

Q Yes?

A Bonners Ferry to Sandpoint - (28.2 miles)

From Bonners Ferry to Naples the pipeline leaves the highway and crosses open country. This pipeline is much shorter than the highway alignment and no construction problems are anticipated. The pipeline parallels the highway from Naples through a good construction area to Colburn, then parallels the Great Northern Railway to Sandpoint. Construction is generally in sandy clay, with some gravel and a small amount of rock. Clearing is in

thick second growth, with trees of 10-inch maximum diameter. The pipeline is accessible from the highway and some secondary roads, and maintenance conditions are good.

Sandpoint to Newport - (28.8 miles)

From Sandpoint the pipeline runs west to the foothills. Then following the general line of a Forest Service road, it proceeds to the pass at the source of Happy Fork Creek. Then running southwesterly, the pipeline crosses into Blue Creek Canyon, then to Blue Lake road and then parallels Blue Lake road to the East road along Priest River. This country varies from gravel in the foothills to ledge rock at the higher points. Right-of-way will be difficult for the last mile near the pass. Clearing will be light except for about 7 miles where timber up to 18 inches in diameter will be encountered.

Crossing the Priest River, by bridge, the pipeline will bear southwest across flat, burned-over country to the west branch of the Priest River, then over a ridge to a crossing of the Pend Oreille River. The river is wide and a crossing was selected using Kelly Island as a mid-point in a double span. About a mile of heavy clearing will be encountered; the balance will be easy. The construction is generally in gravel, with ledge rock on the ridge. Maintenance conditions from Bonners Ferry to Newport will be good.

Newport to Spokane - (36.9miles)

The pipeline will bear generally southwest from the Pend Oreille River to a point about 2 miles east of the Spokane River. After crossing the highway west of Newport,

it enters basalt country, with jackpine cover. This location misses all of the exposed rock. Testing of the ground may reveal other rock which will necessitate minor deviations from the route. The pipeline passes over a ridge and into farming country. It then runs to U. S. Highway No. 195 which it parallels to the Wallace Airport. This country is flat with open jack pine, without underbrush. Near Chatteroy the ditch will be wet for about three-tenths of a mile. After the pipeline crosses the Inland Empire Highway (U. S. 395) it raises to a prairie and runs west to a point near Spokane. There are no construction problems in this country, and maintenance conditions are excellent.

Spokane to Davenport - (36.8 miles)

The pipeline route runs westerly from near Spokane to south of Davenport, crossing Deep Creek Canyon. This section, generally, is in wheat country, and construction will be very easy. A little basalt rock will be encountered where the line leaves Deep Creek. Clearing is negligible, and maintenance conditions are excellent.

Davenport to Columbia River - (103.5 miles)

From south of Davenport the pipeline will follow the Sixth Standard Parallel for 27 miles westward. This country is practically all basalt rock, in land which is of little value and which is used for grazing.

The pipeline route will continue through wheat land along the same tangent westward across the Grand Coulee. Basalt will be encountered in the coulee. A new diversion dam has been constructed across the coulee, and the proposed pipeline crossing will be just below that dam, but above

Dry Falls.

The Hanford lateral will leave the main line about 10 miles from Grand Coulee (64 miles from Davenport).

After leaving the coulee the pipeline will continue west along the same tangent through wheat country for about 7 miles and then parallels U. S. Highway No. 2 for 6 more miles. The route then will enter the Moses Coulee from the southwest and leave through a break in the escarpment; about 2 miles of this section will be in basalt. From here the pipeline will continue west through rolling terrain to the gorge of the Columbia River. Approximately 1.5 miles will be through rough country with rock.

Running southwest, the route drops into the river bottom; grades here will be very steep, up to 70 per cent. This will necessitate some sidehill cutting through about a mile of rock. The proposed crossing of the Columbia River at this point will be on a pipeline bridge with a span of about 1800 feet. Conditions for maintenance along this whole section are very good.

Columbia River to Winton - (29.0 miles)

After leaving the Columbia River the pipeline runs up Swakane Canyon over the ridge into the headwaters of Eagle Creek. While this ridge is the highest point reached on this line (4,000 ft.) snow depth is not excessive. The United States Forest Service reports: "From the head of Swakane Canyon to Van Creek snow reaches a depth of 50 to 60 inches in normal years." The pipeline follows Eagle Creek to its intersection with Van Creek and then follows this creek to the headwaters of the Chumstick. Sandstone

may be encountered any place from the head of Swakane Canyon to the Little Chumstick. There will be some clearing of fairly heavy timber in Eagle Creek and some sidehill construction.

The pipeline leaves the Little Chumstick, crosses the ridge into the Wenatchee Valley, then, crossing the Wenatchee River on a pipeline bridge, it passes over another ridge into the Nason Creek Valley (this is the valley that leads to Stevens Pass.) Construction schedules in this area should be easily followed since there is ample working space; clearing will be medium, and the ditch will be in earth and sandstone. While the country is rough, it is easily accessible over three hard-surfaced roads at low elevation, and many new access roads have been built by the Bonneville Power Administration in connection with the construction of their new transmission line.

Winton to Stevens Pass - (19.0 miles)

The pipeline parallels U. S. Highway No. 2 to the east portal of the old Cascade tunnel. The valley floor is sufficiently wide to permit deviations and thus avoid sidehill construction and any potential slide areas. An excellent construction area is provided by the former railroad yards which extend about a mile east from this portal. Clearing will vary from medium to heavy; some gravel will be found, and a short stretch of rough right-of-way will be encountered before reaching the yard area.

Q Well, this is the point where we are reaching mountainous country again, isn't it?

A The country from Columbia River, the line enters the foothills and the Cascades as it leaves the Columbia River.

Q Yes?

A And it crosses two ridges and those foothills as it approaches Stevens Pass.

Q And Stevens Pass is the pass through the Cascade Mountains?

A That is correct.

Q And you are going on to explain to us, I suppose, in the next sector, how the line gets through the mountains?

A Through the Pass, yes.

Q Through the Pass?

A Yes.

Q All right.

A Stevens Pass - (3.00 miles)

It is planned to use the old Cascade tunnel for the pipeline. This tunnel is 3 miles long; it was abandoned in 1929 by the Great Northern Railway when the new lower level tunnel was completed. The tunnel is in excellent condition; however, gates will have to be installed at both ends to prevent entrance by other than maintenance crews. In all probability, the pipe will be laid on specially constructed saddles on the tunnel floor. This tunnel is large and will permit the use of construction and maintenance equipment. Ventilation conditions are excellent. The maintenance of the pipeline in this whole area will be good.

Q Now, as I understand your remarks, Mr. Goodbody, the Great Northern changed their route?

A Yes.

Q This was the original tunnel through the Pass?

A Yes, this is the tunnel they completed in the early 1900s.

Q Not when the railway was built?

A Originally the railway went over the Pass.

Q Originally the railway went over the Pass?

A Yes. And they constructed this three-mile tunnel, and then the present tunnel, which is some eight miles long, was constructed and this one was abandoned.

Q The present tunnel that is used is on a lower level, I understand?

A The present tunnel, yes. I do not know how much it is lower, but it is lower.

Q And it is longer than the old one?

A Eight and a half miles,I believe.

Q As compared to three?

A As compared to approximately three.

Q Is this old tunnel, the three-mile tunnel, being used for any purpose at all?

A I was there the other day and the State highway has some sand piled in the end of it.

Q Yes, but there is no highway going through it?

A No, there is nothing through it.

Q And there are no trains going through it?

A No.

Q It is abandoned?

A Yes, it is an abandoned tunnel.

Q As far as the railway is concerned?

A Yes.

Q And, as you say, or do you say, it is in good condition?

A Yes, excellent condition.

Q Excellent condition?

A Yes.

Q And it is the ordinary size of the ordinary tunnel that

railroads go through?

A Yes, it is the ordinary size of the ordinary tunnel that railroads go through. It is the regular standard size.

Q What are its dimensions?

A I do not know offhand the dimensions. I have not measured the tunnel, but....

Q Well, can you give an idea?

A I would say it is 14 feet wide.

Q Yes?

A And it should be 15 or 16 feet high, and I am not sure of that.

Q Yes. Well, now, on page 17 you were at Stevens Pass to Skykomish?

A Yes.

Q We are over the Pass?

A After we go past the tunnel we are over the Pass, yes.

Q We are down on the other side?

A Yes.

Stevens Pass to Skykomish - (12.5 miles)

From the west portal of the tunnel the pipeline drops down to the old state highway. This abandoned right-of-way will be used to Scenic. It will then parallel U.S.Highway No. 2 for the next 4 miles. This latter section will be adjacent to the highway, with some rock construction. Clearing, where necessary, will be virgin timber. The pipeline leaves the highway and follows the river bottom; it then returns to the highway near Foss' Camp road. The clearing will be in thick alder and stumps. Construction will be in gravel, with some very large boulders for a short distance.

Skykomish to Index - (12.9 miles)

Between these two points the pipeline will cross and recross U. S. Highway No. 2, and Great Northern Railway and the river in several places. These crossings will shorten the pipeline distance and will not materially add to the cost of construction. Much of this area had been cut over so stumps and second growth timber will have to be cleared. There will be some rough construction, as well as rock. The route will be accessible from the highway. West of Skykomish the snowfall is usually light.

Index to Monroe - (23.8 miles)

From Index the pipeline swings across the north fork of the Skykomish, over a ridge and then into gravel flats. The pipeline then continues to a point about 4 miles northwest of Monroe. Construction is generally in gravel, with a few large boulders on the ridge. To reach the summit it will be necessary to construct the pipeline up a 70 per cent grade for about two-tenths of a mile. The grade down the west slope will not be greater than 30 per cent. Access to this section is over existing fire roads. The line runs north of the towns of Goldbar, Sultan, Startup and Monroe, through semi-rolling country, with the last mile in level farm land. Maintenance over the area from Skykomish to Monroe will be good.

Well, then it takes us into a different part from there on. We have it down from the International Boundary down to Portland, and this covers the section.

Q The only difference is we are going the other way on it?

A Yes. We have read down from the International Boundary,

down to Portland. That was read before and this covers that section.

Q And so you suggest it would be unnecessary to read that, do you?

A Nothing would be gained by reading it.

Q Because we have already done so?

A Yes.

Q Until we get where?

A And the same is true of Columbia Gardens to Spokane. We had the lateral from Columbia Gardens to Spokane. It covers all of this area along Newport to Trail, with the exception of the last seven miles.

Q Well, perhaps you might read that?

A We can pick it up right at Pend Oreille River.

Q And that is on page 22 now?

A Yes, on Page 22.

Q In the middle of the page, Mr.Chairman, in the middle of Page 22. We are just picking out the sectors we have not read before.

THE CHAIRMAN: Yes.

Q MR.NOLAN: All right, Mr. Goodbody.

A

Alberta Natural Gas Company

Pend Oreille River to Trail - (10.8 miles)

The pipeline follows the travelled road from the Border to the intersection with the Great Northern Railway. About a mile of this road on the upper end must be widened to accommodate construction equipment. Dirt removed from the Highway and the right-of-way will have to be hauled, as anything dumped over the bank will fall about 800 feet below on the Great Northern Railway. After crossing the

railroad the line parallels the travelled road into Trail. This pipeline will be constructed through about 7 miles of flat gravel country, 1-1/2 miles of ledge rock, some sandhills, and then about a mile adjacent to the highway. The pipeline terminates at the Columbia River Bridge where a connection will be made with the Consolidated Mining & Smelting Company of Canada, Limited.

Q Now, Monroe to Portland?

A That has all been read.

Q Because we were doing that on the way from Vancouver to Portland?

A Yes.

Q Page 24 at the top?

A Yes.

Q MR.GOODALL: Have you given us the lateral to Hanford?

A The lateral to Hanford was surveyed after this report,after all of this had been written, and I have not a description of it. However, I can furnish the Board with a description of that lateral.

Q MR.NOLAN: But you have been over that particular lateral?

A Yes, I have been over that particular lateral.

Q Perhaps you could give it orally?

A I could give it to you orally.

Q When did you go over it?

A Two weeks ago.

Q And would you give the Board a general description of the terrain, because they are interested in the kind of a country which you go through to get to Hanford from the main line?

A Starting from the main line between Moses Coulee and Coulee City, or Grand Coulee, we proceed on a directly south line, and we follow right along the section line. The country is partially cultivated, generally low sagebrush. There are no trees. The roads are low-grade farm roads in the entire area, and the ground will vary from basalt rock to volcanic ash. It is in rolling country down to Euphrates, then from Euphrates - at Euphrates we cross the main highway between Yakima and Spokane, and proceed down south along the same section line through sandy country that develops into sand hills as we get further south. There is one river crossing, and you have to cross the Saddleback Mountains, which are quite high and steep, very precipitous on both sides, and our line ends at the Hanford border, at the border to the Hanford Atomic Energy Plant, in a flat dropping slope which drops into the Columbia River. It is about 70 miles, the whole total of the lateral.

Q And, of course, it is in your estimates of cost?

A Yes, it is in my estimate of costs.

Q All right. Now, at the top of page 24?

A

COST OF CONSTRUCTION

Submitted herein is a summary of the detailed construction cost estimates. They include the grid gathering system in Alberta, the main line through Canada and the United States, and the various sales laterals in British Columbia and Washington. The main cost subdivisions are: Surveying, Right-of-Way, Materials including Pipe, Coating and Valves, Installation Costs, Compressing Stations, Measuring and Regulator Stations and other items inherent in a construction

job of this nature.

The magnitude of the scheme and the lack of data for similar operations in this area preclude the use of any encumbent unit costs.

Q What is am encumbent unit cost?

A Well, there is certainly a lack of experience, general experience in the area, no pipeline over that. There has never been anything stretched across there.

Q Well, is an encumbent unit cost one that is based on the experience of somebody else?

A Yes. That would be one that you would catch out of the air. It is something that we had to develop our unit cost ourselves.

Q And there were none?

A No, there were none.

Q So then, if you will go on with your script now, please?

A Accordingly, great attention has been paid to detail. For example,in estimating the cost of laying the main line pipe in Canada, the item "Pipe Placement" under "Installation Costs"is compounded from ten cost subdivisions,namely: clearing right-of-way, grading right-of-way, trench excavation, load, haul and stringing the pipe, pipe bends and angles, lining up, welding joints, lowering and tieing in, field coating, backfill and clean-up. Each of these items was further subdivided for different types of terrain as well as surface conditions along the route. Thus, Item 5 - Installation Costs - Pipe Placement, Bends, Welding and Coating $1,176,983 Alberta Natural Gas Company Main Line in Alberta is the sum of no less than 24 separate estimates. It was felt that the costs in summary form as exhibited

herein would present a clear over-all picture of the scheme.

It will be noted that Canadian Import Duty has been included for all Canadian pipeline materials. It is the policy of the applicants to purchase all such materials as are available in Canada. Since, as yet, there is no definite information on this subject, it was deemed advisable to include this item and to err, if at all, on the side of conservatism.

As has been mentioned previously, no comparable construction job has ever been undertaken in this or any other similar area and consequently, an allowance must be made for unforeseen difficulties. To cover such eventualities, a 10% contingency item has been added to the cost estimates.

Other expenses included are Contractors' Fee - 5%, Interest During Construction - 5½% (based on a 3-5/8% interest charge, 75% debt coverage and a two-year construction period,) Engineering Supervision - 4% and Overhead during Construction and Preliminary Expenses - 3%. Although this represents a markedly conservative attitude, omission of any of these items would not be in keeping with sound business principles.

Q Now we come to the Tables, and the first Table, which is not numbered, is the Summary of Estimated Construction Costs?

A That is correct.

Q And under the head "Alberta Natural Gas Grid Ltd." we have the figure of $33,000,000.00 odd, that is right, isn't it?

A $33,594,595.00.

Q Yes, and under "Alberta Natural Gas Company"?

A We have a total of $21,324,997.00.

Q Yes, and then under Northwest Natural Gas Company?

A $55,125,862.00.

Q Now, the first of those two items, the $33,000,000.00 and the $21,000,000.00 odd would be Canadian construction, construction in Canada?

A Money spent in Canada,yes.

Q Money spent in Canada?

A Yes, and obtained from, I am sorry, that should be - we do not know where all the materials are coming from, but the construction would all be in Canada.

Q That would be the cost of the line so far as you are able to estimate it now, to be constructed in Canada?

A That is correct.

Q And the rest of the line to be constructed in the United States is $55,000,000.00?

A That is correct.

Q That is just about the same amount, isn't it?

A Yes, equal.

Q 50-50?

A Yes.

Q Now, tell me this, you followed exactly the same procedure in the breakdown in the succeeding Tables?

A Yes.

Q As you did in Route A?

A Yes.

Q There is no difference at all?

A No, there is no difference.

Q Except that you made a mistake in one of the pages. Perhaps

you will turn to that now?

A I will see if I can find it now.

Q It is Route B and it is the main line from Eastport, Idaho, to the International Border at Aldergrove. I am sorry, sir, these pages are not numbered, and they are a little hard to pick up. It is the main line in the United States?

A Northwest Natural Gas.

Q Northwest Natural Gas Company. And the line is Eastport, Idaho, to Aldergrove. Mr. Chairman, have you got it yet?

THE CHAIRMAN: No.

MR NOLAN: It is the tenth page in the Tables, Eastport, Idaho, to Aldergrove. You will see, sir, that there is a heading "Northwest Natural Gas Company Estimated Construction, Main Line in the United States." And then there is the description, Eastport, Idaho, to International Border at Aldergrove, B.C., and Portland, Oregon.

THE CHAIRMAN: Yes.

Q MR.NOLAN: Now, under Item 3, "Material", there is a sub-head "Pipe".

THE CHAIRMAN: Yes.

Q MR.NOLAN: And the "Unit" is expressed in miles, under the word "Mile", M-i-l-e; and the number of units is expressed in the figure 373.2; and the Unit Cost $125.00. Now, as I understand it, in those first three items where the word "Mile" is shown, Mr. Goodbody, the word "Ton" should be put in?

A Yes, the word "Ton" should be in those three.

Q But that the number of tons is as it is expressed in there. 373.2?

A No, those are the number of miles. I have the number of

tons that I can give.

Q Well, give me the number of tons?

A In the first one, 24" x 0.25" Wall Thickness is 62,511 tons.

Q Yes?

A And in the next one 22" x 0.25" Wall Thickness, it should be "Ton" and the figure instead of being 114.6 should be 17,699 tons.

Q And the third?

A And the third 20" x. 0.25" Wall Thickness, the word "mile" should be "ton", and the 164.3 should be 23,227.

Q Tons?

A Tons.

Q Now, the unit cost of $125.00?

A Is correct.

Q Is correct?

A Yes.

Q And the figure in the sub-total, those figures are correct?

A Yes.

Q $7,813,875.00?

A Yes, $7,813,875.00.

MR. C. E. SMITH: Would you give the totals again?

Q MR.NOLAN: The first one, the total is what, Mr. Goodbody?

A Do you want me to give it?

Q Yes, please?

A 62,511.

Q 62,511?

A Yes.

Q Yes?

A And the next one is 17,699.

Q 17,699?

A Yes.

Q Yes?

A And the third one is 23,227.

Q And so while we change the miles to tons, we in no way change our sub-total or our grand total?

A That is right.

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CROSS-EXAMINATION BY MR. D. P. McDONALD.

Q Mr. Goodbody, I just want to ask you, did you write out this report? Did you prepare this report?

A We prepared the report, that is, I and the men who were working with me.

Q You are personally in charge of it?

A Sponsoring it, yes.

Q And you are responsible and you are taking oath and this is your evidence?

A Yes, sir.

Q And you have made many statements and you have placed your oath behind each?

A Yes.

Q Now, let me see if I recollect it. You told us yesterday that you have had experience in the building of one natural gas pipe line?

A Yes.

Q That was in the vicinity of Los Alamos?

A In Western Mexico.

Q In New Mexico?

A Yes.

Q Which had to do with some government installations, is that not so?

A Yes.

Q When was that line built?

A In 1949, in April and May.

Q 1949?

A Yes.

Q Just last year?

A Just last year.

Q How long was it?

A 100 miles, I think.

Q And what type of country was it?

A Oh, it is flat and semi-rolling country.

Q What size was the line?

A 12-inch.

Q A 12-inch line, and what pressures are used in transmitting gas through it?

A That I do not know. I might guess. I was not concerned with that.

Q What were your duties in connection with it?

A My duties with it was that I helped to assemble the equipment for it and helped out on the estimating, and that was my duty. I was there. I was running another job down below and I was on and off the job at different times.

Q You did not locate the line?

A No.

Q You did not supervise the actual construction of it?

A Not of that line, no.

Q Just let me understand this, are you employed by Haddock-Engineers Limited?

A I am employed by Haddock-Engineers Limited.

Q You are not employed by Pacific Pipelines?

A That is correct.

Q Can you tell me this, was this job that was done at Los Alamos, was that a lump sum contract by Pacific Pipelines, if you know?

A No, it was a joint venture of the Pacific Pipelines and

Haddock-Engineers Limited.

Q Was it a lump sum contract?

A It was a unit price contract.

Q Then would you mind telling me what a unit price contract is?

A A unit price contract is a contract that is set up on the basis of this one. It is an estimate of the amount of line, the amount of rock, and everything is set up by the engineer previous to doing the work. He sets the price of each unit and his remuneration is set up as an amount on each item he accomplishes.

Q You base your contract on the amount of work there is to do. For instance, there is so much rock work in it?

A On that particular job there was a rock clause in it.

Q And what was that?

A That I do not know. It was a unit price, like, and in the specification they described what was rock and what was not rock.

Q And if the preliminary survey showed that generally there was 20 miles of rock work to do and when you actually went to do the job, if there was 25 miles of rock work - -

A On this particular job the preliminary survey showed a great deal more rock than actually existed. The surveys made by the contractor previously indicated rock that was shown in the unit did not exist or at least we hoped they did not exist. That was one of the factors that played a great part in our securing that particular piece of work.

Q Let me see if I understand you. Originally the estimate was accepted with regard to rock?

A That is right.

Q So that instead of there being 20 miles of rock there were 15 miles of rock. Just as an example?

A Yes.

Q Did you get paid for 20 miles of rock or did you get paid for 15?

A For 15 miles.

Q Just actually what was there?

A Actually what was there.

Q That is something in the nature of a cost plus contract?

A No, definitely not. You assume the responsibility for what you are going to do, and you would refer it to each part of the job and when you get through you set up your cost and to that would be added your percentage, of that cost. But this way you agreed to do the work, to dig a ditch in dirt for so much money and in rock for so much money. To lay the pipe for so much money per foot or per mile and your profit must be in your units, because you are going to get paid only for what you actually do, the units you have accomplished. You are going to get paid the price for those units.

Q As I understand it, you are going to get paid for the number of units that actually exist?

A I say the number of units accomplished at the unit price bid.

Q And this 5% contractor's profit, was that added to the unit cost or was that included in your unit cost?

A The profit is included in the unit cost and it varies very much. The contractor's profit is varying in percentages.

Q So that to be clear on it, the job at Los Alamos was a unit cost including your contractor's profit?

A Yes. I should not say unit cost. Our unit bid included the contractor's profit.

Q Yes?

A Yes.

Q Oh, yes, not your cost.

A In order to keep it straight.

Q Yes. Now, you referred also to the question, Mr. Goodbody, of acquiring right-of-way. Have you had experience in acquiring right-of-way?

A A good many years ago I had experience in acquiring right-of-way, but that is all.

Q In what area was that?

A In Southern California.

Q Yes, and do you remember the basis on which you acquired the right-of-way at that time?

A Per acre. We were building roads in a country that needed the roads so the right-of-way was not a great item. It was not hard to get.

Q Have you had experience with acquiring pipe line right-of-way?

A No.

Q You have not had any?

A No.

Q Where do you get this right-of-way estimate that you have in your submission?

A That is an estimate that I set up myself that I felt more than likely we will need before we get through. The value of the land. It is an average that I felt should be the average cost.

Q Can you just tell me what average you take into account? First, the value of the land, you mentioned that?

A Yes.

Q And then there is the question of growing crops, is there not?

A A person would have to take that into consideration, the value of the land, the growing crops and some places there is going to be timber to cut. Some places the forest services are going to require you to buy the logs that you cut down. I would call this more of an allowance for right-of-way than anything else.

Q And you intended to include damages and all incidental costs?

A Yes. I think it is ample, considering the country that we are going through.

Q And it includes legal expenses and filing of easements?

A Yes, sir.

Q Now, just a general question, Mr. Goodbody, have you had any experience in the operation of a natural gas pipe line?

A No.

Q Have you had any experience in the operation of an oil pipe line?

A No.

Q Is it true most of your work has been connected with road construction?

A No. I have done a great deal of pipe line construction. From 1936 until 1940 I was solely on pipe line construction. We built steel lines and we built concrete lines. I have been on pipe line installations from the time - in municipal improvements and so on. The last pipe line I did was the San Diago Aqueduct, which was a 48-inch steel line, welded steel line.

A I have worked on pipelines in Southern California, and my knowledge of them includes New Mexico and in Massachusetts.

Q And were those cross-country lines?

A Yes.

Q And you have done a great deal of municipal work?

A Yes.

Q Outside of the 100-mile line in New Mexico you have not done any cross-country gas line work?

A No, not gas lines.

Q So you tell me then you have no experience in the maintenance of a natural gas pipeline system?

A Yes, that is right.

Q Now, in the Exhibit that we have here, you refer to maintenance from time to time. I was wondering if you could tell me what activities or what work was included in your considerations with regard to maintenance of a natural gas pipeline?

A I took R.B. Wilson of Pacific Pipelines & Engineers, Limited, who was employed for a great many years by Pacific Gas & Electric in San Francisco, over the line and consulted with him about these things. It becomes quite obvious the things that you have to do to get the equipment in a certain place to do maintenance work, and that is what most of my wording is based on. My conclusions are based on his knowing what you have to do to get equipment into certain places.

Q Well now, Mr. Goodbody, excluding a major break in the line and the gas actually comes out of the pipe, what maintenance would be required for the pipeline?

A Well, just an inspection and to check the valves along the line.

Q Well, the valves are going to be - - how wide are you going to have your valves, what distance?

A Approximately 10 miles, that is, an average of 10 miles.

Q Less than 10 miles in places?

A And more in others. We have set up an average and the actual location of the valves has not been determined.

Q Your thought then is that the valves should be inspected occasionally?

A I would think so.

Q And they could be strategically placed so that they could be inspected easily?

A It would be desirable, surely.

Q Now, where would you expect breaks in the line in the sense that you would actually have a discontinuance of service?

A Well, if you got into a slide area you might have a broken line, and breaks might occur in any pipeline at any time.

Q And where would they occur in the pipeline? What in the pipeline might be conducive to breaks?

A Well, if the ground was broken by a slide. You do not know. If it was normal you would get your break in the longitudinal seam.

Q The longitudinal seam?

A Where the pipe is brought together.

Q Or on your weld?

A It might occur there, but I think that most of the trouble - - I will say that most of the trouble I know of that has occurred on natural gas pipelines has occurred when the

longitudinal seam was split.

Q Now, would not all pipe that anyone put in the ground be adequately inspected ?

A Well, surely an attempt is made and it is all put under test but even then when you get under working conditions you get a different condition, and you get breaks.

Q You mentioned you have heard of natural gas pipeline breaks. What is the frequency of breaks in natural gas pipeline installations?

A I do not know.

Q Well, do they usually occur on tests, when the line is tested?

A Well, the majority of your breaks are going to occur in the mill before they come out, that is, if you are starting from the plate, and you should pick up your breaks in your tests.

Q I am thinking of tests of the pipeline?

A Unfortunately the breaks are not picked up in all of them in the tests and there are a certain number of breaks that will occur in the line when it is in operation.

Q What would be a fair average of breaks, of frequency of breaks, in the pipeline on tests? Let us take a unit of 100 miles.

A Oh, I don't know.

Q Would you expect one break in 100 miles?

A I do not know what it would be in the gas line. I have built lots of water lines and never had a leak in them.

Q Yes?

A I would not anticipate many breaks, if any, in a line on your tests.

Q On a properly constructed gas line?

A Properly constructed they would be very low.

Q I will also put it to you, if there are going to be any breaks you are going to have them in the first year, are you not?

A You should get most of them in the first year. That is, if they are going to come in your seams, if there was to be a failure you would get them in your first year. Ground failures might come any time.

Q So you can not tell me anything about how many breaks there have been in United States gas lines in the United States during the past year?

A That was published in an article but I do not remember what it was.

Q And you can not tell me? I was thinking also of the past 5 years?

A I remember the article but I do not remember.

Q You do not remember what particular pipeline it had reference to?

A No.

Q Now, we discussed this matter of testing the pipeline, Mr. Goodbody. Could you tell me what you have in mind about testing your lines if, as and when built?

A In what way?

Q What pressures would you use?

A I would rather the man that designed the line talked about the tests. I do not know what he is going to put on it. We have not set up the sizes of pipe to be used. The sizes of pipe, the wall thicknesses, have been given to me by Mr. Dixon.

Q Yes. Well, I am just - -

D. S. Goodbody,
Cr. Ex. by Mr. D.P. McDonald.

A What would be the test on it is something I do not know.

Q Well, I understand you have an item of cost covering testing.

A Well, we are going to purge the line. It is another allowance that is made to purge and test the line.

Q How is that cost made up?

A That was made up by one of the engineers who figures the amount of gas it was going to take to test the line and I do not know what figure he used.

Q Yes. Now, can you tell me this, in your construction costs have you included an item for X-ray of your welds or seams?

A That would come under engineering and inspection, if they wanted to X-ray them. We certainly would not include it in our estimate.

Q And go all along the pipeline as you lay the pipeline?

A As we lay the pipeline? That would be something that would be up to the engineers whether they wanted to inspect those welds or not.

Q If welds were X-rayed and properly inspected is there much possibility of any trouble from that particular source?

A Oh, naturally the welds that you X-rayed, you know whether or not they are all right. Whether they would X-ray every weld along the line is something I do not know. That would be a matter of policy to be determined by the engineers.

Q So that do I take your evidence to mean this, that your concern about maintenance is moving ground? Is it?

A That is the only thing that I can consider, is the danger to the pipeline from the moving ground.

Q Yes?

A And the accessibility, year-round accessibility to those pipelines. Those are things I am capable of predicting, I think.

Q I am not thinking about accessibility, I am thinking of what will happen to the pipe that will require maintenance.

A Well, I think we have covered that. As I said, the only thing that you can help while you are trying to determine where a line should go is whether or not the ground is stable.

Q Then what have you to say about most of the difficulties in the pipeline maintenance occuring adjacent to the compressors?

A Well, you are going back into something that I told you, I have not operated a gas line.

Q All right, sir.

A We are going to get those compressors where they are available. That is something I do not know about.

Q Now, as I understand your statement as contained in these exhibits, that in your opinion accessibility to the maintenance, accessibility to a pipeline is a major factor in the location of a pipeline?

A Oh, I would say very definitely.

Q I mean, that is the experience of you and your firm and your advisors?

A Certainly I think any experience of anybody that has done anything at all, accessibility is a prime factor.

Q In the maintenance of a pipeline?

A In the maintenance and construction of a pipeline.

Q There is a difference, is there not, between access, going to the place once and laying the pipeline and then going back year after year?

A No. All the pipelines that I have seen built there is not a great access road to it. The trail roads are very low-grade roads, and if you can get in there once, why generally somebody thinks you can get in there again.

Q Are you familiar with the location of the Tennessee Gas Company line?

A No.

Q In Kentucky?

A No.

Q Are you familiar with the Columbia?

A No, I am not familiar with that.

Q Are you familiar with the United Gas Line that is laid through Lake Pontchertrain?

A No,

Q You are not?

A No.

Q Have you inspected any of the large gas lines in the United States for the purpose of checking the maintenance costs?

A No.

Q Or maintenance conditions?

A No.

Q Well now, Mr. Goodbody, you have used throughout these two exhibits, you have referred continually to this question of maintenance, lower maintenance cost. Can you tell me, what is your estimate cost of maintaining pipeline per mile?

A I have not any estimate on it.

Q You haven't any estimate on it?

A No. I base that on the factor that you can get to a certain place in a certain length of time. That is, my opinion is, if you are accessible you can get through quicker and therefor it is cheaper.

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Q So that you cannot tell me how many men you would have at your maintenance stations?

A No.

Q Or where you would locate them?

A No.

Q Or what equipment they would have?

A No. We made an estimate, or an allowance for equipment, to take care of maintenance and so on.

Q In your capital costs you have included equipment?

A Yes, and allowance.

Q I am talking about the maintenance cost, about which under oath you said that this is the easiest road, with the lowest cost of maintenance of all routes. Why do you make that statement?

A If I can make it any clearer to you I will go back over it again. I have not maintained a gas pipe line. I have not included anything in here as maintenance costs. I have based my opinion on the cost of maintenance on the stability of the ground, which I think I am capable of having an opinion on, and the accessibility of those areas. And I think it is clear to everyone that if you can/go to X place in 10 minutes and you go to the other place and it takes an hour and a half, it costs you that much more to maintain your line, and you have to have that much more equipment and that much more money spent.

Q All right. Let me put it to you this way, you have given me one place where earth is going to be moved on your route?

A I beg your pardon?

Q One area of 83 miles in which you have referred to moving earth?

A I don't know what you want me to answer to that.

Q What I am getting at is this, that you have given, you have said that this has lower maintenance cost, the lowest maintenance costs, and you cannot tell me what the frequency of breaks is, you cannot tell me what the experience of other pipe lines is, and I want to know how many you have to get in to do this work, and you can't tell me, or can you tell me?

A I am not going to attempt to tell you, no, sir, because I do not know. I do not know how many times you would have to go in there, because a piece of ground that one might think was quite stable might slide out, and a piece of ground that you thought was going to slide, might not slide. Certainly a man is limited when he cannot tell you how many times he is going to go to a certain area.

Q The long and the short of it is that you do not know about the maintenance at all, isn't that just the size of it?

A I have tried to make that clear to you. The only thing I know about maintenance is the length of time that it would take you to get there.

Q If you never have to get there then you wouldn't have to worry about it?

A If you did not ever build a pipe line you would not have to worry about it. That is practically the same thing.

Q What I wanted to know from you is as to the amount of cost that you included in your estimate of maintenance, the amount that you attributed to accessibility, the ability to get there?

A Well - -

Q Something you are going to charge up per year, that is, is it not?

A Well, it has got to be - the ability to get there is a major factor in your maintenance, and I have not attempted to set up any particular price on maintenance at all.

Q Yes. Now, I notice in your dealing with Route B, Mr. Goodbody, that you refer to snow at one point on Route B in the vicinity of - -

A - - Winton?

Q Yes?

A Yes.

Q I was just wondering what is the snow condition of Stevens Pass?

A The snow condition in the Stevens Pass varies. It varies very rapidly in the Stevens Pass, as it does in all of the Cascade Mountains, as the condition varies and as your elevation varies. It piles very high on the top of Stevens Pass. I will give you, just as an example, two weeks ago in the top of Stevens Pass there was about 3 or 4 feet of snow, I would say, and on the level, that is there was 3 or 4 feet of snow on the level. At the mouth of the tunnel there was, the road was clear, and there was about six inches of snow.

Q Yes?

A That is a comparison. The snow depth varies and the fall of the snow varies in all of the Cascades that I have been able to get records on.

Q And it varies from year to year?

A Yes, extremely.

Q Yes?

A And it varies in locations from year to year.

Q Well, do you consider there are better snow conditions in the Stevens Pass than in the Hope-Princeton area in British Columbia?

A I think for the elevation we have to go through Stevens Pass that there are better snow conditions in the Stevens Pass, using the tunnel, than you would have going over the Allison Pass.

Q With reference to this tunnel, is there a power line going through that tunnel?

A No.

Q Now, does the snow really amount to anything at all, as far as the pipe line itself is concerned?

A So long as it just lies on top of the pipe line it does not matter.

Q Unless it is the question of a snow slide which actually gouges out the line, it has no reference to a pipe line at all?

A That, and if you have to get in to maintain it. If the snow piles up, that would be a problem.

Q Now, Mr. Goodbody, just let us work out the dates here. This report of yours is dated in May, 1950. Were they just completed in May?

A The actual physical printing had just been completed, yes.

Q Yes. And that means, of course, that your Tables at the back have been calculated during the first part of this year?

A Yes.

Q I have heard these figures before, some months ago?

A Yes. You heard similar figures. We roughed up an estimate on this, as you know, a year and a half ago.

Q Yes?

A It was done then.

Q Well, I was just wondering how you made your estimate of the Hanford line?

A I had flown over the line. I had not been on the ground. I put that down from what I saw flying over it, that is, the Hanford lateral. We did not get a final word on the Hanford lateral and I came out and went over it before I came to this hearing.

Q So that your costs in regard to the Hanford lateral are subject to considerable revision?

A I would not say considerable revision, after being over the ground. I might revise them a little. I would say they are substantially all right.

Q Well, now, will you agree with me on this, Mr. Goodbody, that the construction of the pipe line is purely a matter of dollars and cents. You are going to build it where it will give the service at the least cost, is not that your proposal?

A That would be - you might elaborate. You are talking about the least initial cost?

Q Yes.

A Or are you talking about - I wonder if you would be a little more specific, if you could, and set them up separately, because it might be confusing if I answer you.

Q There are two factors in the final price to the consumer, are there not?

A Yes.

Q That is, operating costs?

A Yes, operating costs.

Q And then there are the capital charges?

A Yes.

Q So that if you are thinking of the consumers' interest, you have to weigh the two, don't you?

A Yes. They both have to be weighed.

Q Now, what I want to ascertain from you is, when you come to a difficult place in the line, or a difficult location - -

A Yes?

Q - - you have to weigh the investment in a shorter pipe line, or the investment in a longer pipe line, and the installation cost with regard to remedying the defects that you are facing, isn't that so?

A Yes. You have to take three things into consideration. You would want to be in the right kind of ground. And it is merely a matter of dollars and cents as far as your construction costs are concerned, and when you know what your pipe is going to cost, and what it will cost to put it in, it is purely a mathematical proposition of deciding where the line should go.

Q Now, how could you make that decision in regard to a pipe line unless you know what saving you are going to have in your maintenance and all those things?

A I do not know exactly what you are trying to get at. Do you mean if you don't know what your maintenance costs are going to be in either area, or in any area?

Q I have been trying to get from you some estimate of the cost of maintenance?

A Well, I have told you, or have tried to tell you, that there is nothing in here that sets up any maintenance cost. I have

not attempted to set up maintenance costs and I would be out of place in attempting to set up maintenance cost. I think it is a job for somebody who operates a pipe line.

Q And if you can not do it, and have not done it, and it is not within your ability, how have you applied this factor of maintenance in the location of your line and the selection of the route?

A I answered that before, and I do not think it takes a great deal of thought to decide how long it would take you, whether you were going to walk or drive, to get to a certain place, and if you are paying a man $1.00 an hour and it takes 20 minutes to get to some place, you have paid one-third of a dollar to get him there, and if it takes two hours to get there, you pay $2.00 to get him there?

Q That is right.

A That is the reason or the basis where I say the maintenance conditions depend on whether the ground is stable itself and accessible, closely accessible from existing roads.

Q Well, yes, but then do not you have to weigh that dollar or $2.00 against this factor, that to build it in one place might cost you $100,000.00 and to build it somewhere else it would cost you $300,000.00 and the capital advantages very much exceed your other items?

A As far as I am concerned, if you were to take two areas and one area was not safe country for a pipe line, and it was cheaper to build a pipe line through the unsafe area, I think you would have to weigh very seriously using the unsafe area for your pipe line and you would go around and use the more expensive area.

Q It depends on accessibility, not a matter of safety?

A If your ground was not safe and was accessible, you would be better advised to spend some extra money.

MR. McDONALD: I was just going to go on to another subject, Mr. Chairman.

THE CHAIRMAN: We will adjourn until tomorrow morning.

MR. NOLAN: Before you rise, sir, I have for distribution a very short submission which is entitled "Estimated Cost of Installation of 24-inch Pipe Line, Princeton-Hope-Flood, B.C." by Ebasco Services Incorporated. These have just been prepared and with your permission we will distribute them now, in order that counsel may have them.

THE CHAIRMAN: Yes.

(Hearing adjourned to 9.30 A.M., June 8th, 1950.)